VOLUME 26 NUMBER 10

The Journal

OF THE

AMERICAN DENTAL ASSOCIATION

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The Journal of the American Dental Association. Vol. 26, No. 10. Published by the American Dental Association, 212 East Superior Street, Chicago, Ill. Yearly subscription $5.00. Single copy fifty cents. Entered as second-class matter, January 20, 1939, at the postoffice at Chicago, Ill., under the act of August 24, 1912. Published monthly.

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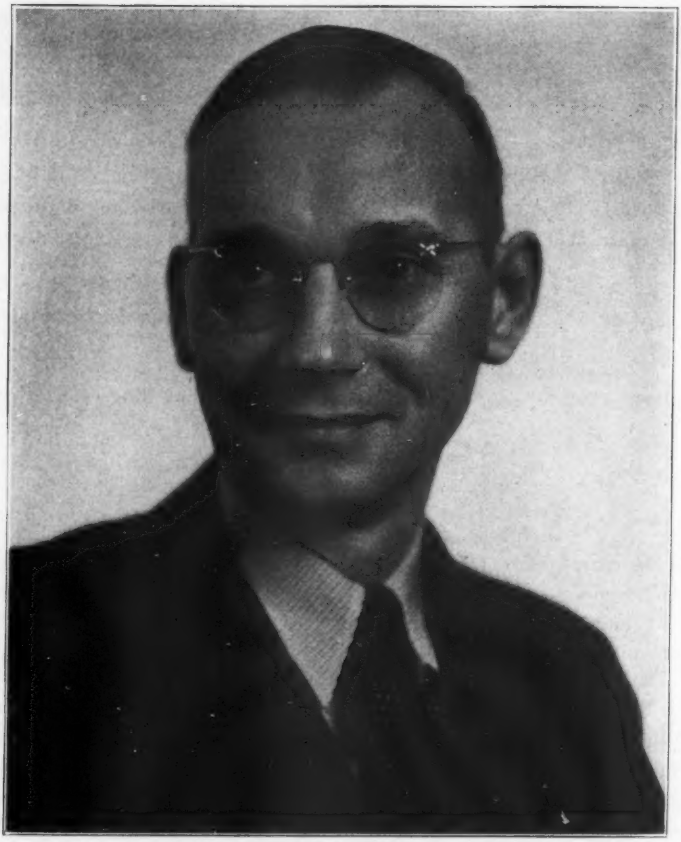

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First Vice President of the American Dental Association

THE JOURNAL
of the
AMERICAN DENTAL ASSOCIATION

Vol. 26 OCTOBER 1939 No. 10

EFFECT OF DISEASE ON HUMAN JAWS AS RELATED TO THE PROBLEM OF DENTURE PROSTHESIS

By ELBERT CROSBY PENDLETON, D.D.S., M.D.S., Chicago, Ill.

THE effect of periapical and periodontal disease is a problem of deserved interest in the treatment of persons subsequently requiring prosthetic dental restorations. This may be a somewhat personal conclusion from the review of a series of studies conducted by Eugene S. Talbot a quarter of a century ago.[1] Talbot's work on "Interstitial Gingivitis" may be studied with renewed interest in view of the more recent concepts that have developed from the works of Ham, Leriche and Policard, Key, Gallie and Robinson, Jaffe, Maximow and Bloom and others who have provided a broader understanding of normal and pathologic development of bone.

Divergent opinions contribute to our confusion in the study of this problem. The terms absorption and resorption are, unfortunately, too often used loosely in our literature and, as in any confusion of terms, the student is perplexed and the subject remains in a vale of obscurity as regards the nature of tissue change.[2]

Notwithstanding the well-known fact that bone performs the dual purpose of a supporting body structure and a calcium reservoir, it is a highly differentiated tissue.[3] In inflammation, the transitional changes of the cellular elements exhibit characteristics that may be unlike those in the adult tissues under normal conditions. Environment is apparently a potent factor in the function of the cells.[4] Therefore, there are many elements that do not tend to simplify the study of bone, which is the most transitory of all the connective tissue substances.[5] Ham[6] cautions that "great care must be used in deciding whether the picture seen in bone resorption represents cause or effect."

Absorption is the withdrawal of calcium from the bone matrix (halisteresis). It is a physicochemical mechanism effected by a disturbance in the equilibrium of the calcium content of the blood.

From the Foundation for Dental Research of the Chicago College of Dental Surgery.

Read before the National Society of Denture Prosthetists.

Absorption is effected by the carbon dioxide tension of the blood and tissue fluids and does not appear to be associated with the action of the osteoclasts.[7] Deficiency diseases such as rickets, common to children, and osteomalacia, common to adults, are evidenced by changes in the skeletal framework. According to the observations of Key, this manifestation appears not alone in the bone trabeculae.[8] In adapting itself to altered conditions of calcium metabolism, the bone may provide the blood with the necessary mineral elements, calcium and phosphorus. The opinion appears to prevail that in senescence absorption of bone is the rule rather than the exception. However, in the study of edentulous jaws of aged persons, the osteocytes appearing in the lacunae are invariably living cells; which, according to Ham, signifies a state of permanency of the calcified matrix.[9]

The resorption of bone should properly be considered not as a destructive process, but rather as the first of the two phases in its growth and development. Under ordinary conditions, resorption may be identified by areas of erosion on the surface of the bone. In the hollowed-out spaces, Howship's lacunae, osteoclasts may be seen. This is definitely a tear-

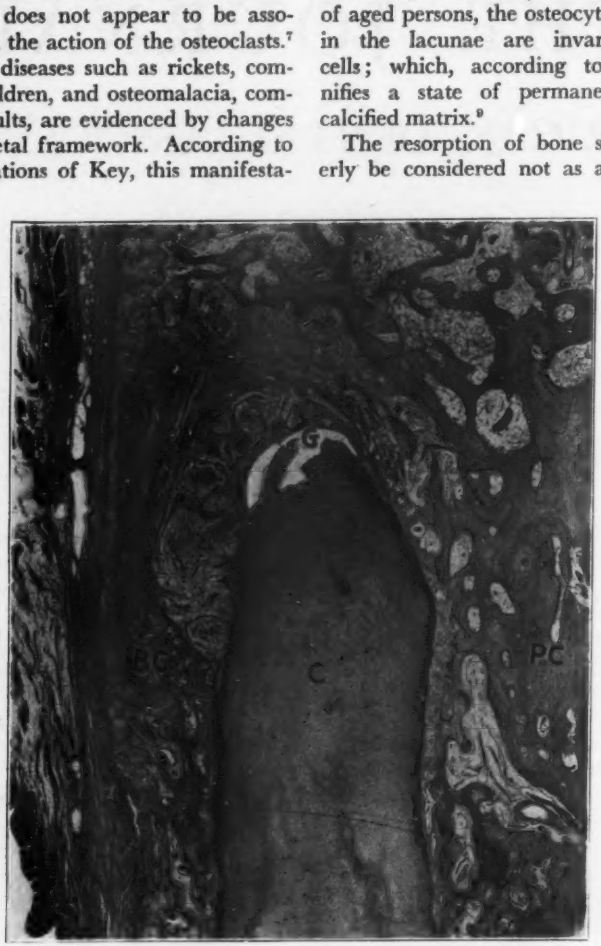

Fig. 1.—Right maxillary cuspid root from man 47 years of age. G, granuloma at apex of root; large area of bone destruction; space filled by dense fibrous connective tissue. BC, buccal cortex. PC, palatine cortex. (× 12.)

ing-down process. Later, however, a layer of young bone may be formed at the site of the transformation, and lining its surface are osteogenic cells and osteoblasts. That the reconstruction of bone is based entirely on the activity of the osteoblasts and osteoclasts is the opinion of Maximow and Bloom.[10] This may be interpreted as a confirmation of Ham's conclusions that osteoclasts, which indicate the process of resorption, are but one of the factors in the phenomenon of tissue change.

Ham also states that "evidence indicates that one should not think of osteoclasts as cells which make their appearance to cause bone destruction, but rather as cells which develop as a result of a foreign body stimulus after bone or cartilage is breaking down because of some other primary mechanism."[11] On the other hand, Maximow and Bloom refer to osteoclasts as cells which dissolve or digest bone.[12] Whether resorption which is accompanied by inflammation in jaws affected by periodontal and periapical disease results in the destruction of the tissue or in its repair appears to depend upon two conditions: (1) the intensity and concentration of the irritant, whatever it may be, bacterial invasion, mechanical injury or chemical agents, and (2) the resistance of the host. According to MacCallum, the underlying cause of every abnormal change, except tumors, is some form of injury, and inflammation is the immediate protective and defensive reaction to injury.[13]

According to Boyd, "the repair of injured tissue is as fundamental a process as inflammation."[14] Adami recognized two series of changes in the cells of inflamed tissue, which were termed degeneration and regeneration.[15] Resorption and inflammation appear as inseparable associates in periapical and periodontal conditions reported in this study. The intensity of the irritant may be interpreted by the degeneration, destruction or repair of the tissue.

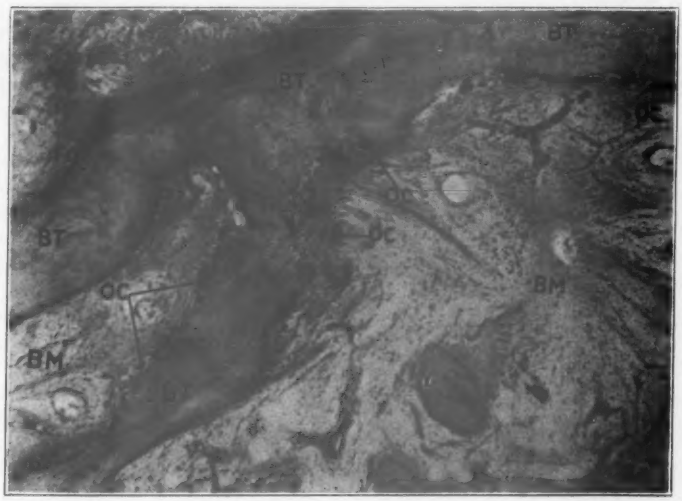

Fig. 2.—Higher magnification of Figure 1. Bone trabeculae above the apex of the cuspid root. BM, bone marrow showing fibrosis. OC, osteoclasts lining the surfaces of bone trabeculae. BT, bone trabeculae. (× 90.)

Talbot called attention also to the failure of the roentgenogram to present a true picture of the pathologic processes in the bone affected by periapical and periodontal disease.[16] In these conditions, the fact that the bone marrow is extremely fibrous indicates a chronic inflammation. It is only by the closest correlation of the roentgenogram and histologic sections that accurate interpretations can be made.

Fig. 3.—Right maxillary first bicuspid. OM, oral mucosa. PC, palatine cortex. BC, buccal cortex. FB, free bone above buccal root in fibrous connective tissue, filling depression in buccal cortex, indicating course of sinus from cuspid root. S, sinus. FB, free bone presumably from the buccal cortex. (× 5.)

The conclusion commonly prevails that after the natural teeth are lost, the human jaws inevitably become atrophic, as they are deprived of the mechanical stimulus afforded by the stress of mastication. Clinical records do not appear to provide sufficient evidence for the substantiation of this widespread theory. On the contrary, the preponderance of evidence appears to disprove the conclusion. Moreover, histologic sections of human jaws, prepared in series, provide some very convincing evidence that the primary factor in loss of the teeth is the degenerative processes in the bone and connective tissue in periapical and periodontal disease. Coolidge has called attention to the rapid resorption of alveolar bone in inflammatory changes in gingival tissue.[17] The dominant trend in the processes of resorption in edentulous jaws that have supported artificial dentures and others on which no artificial substitutes for the natural teeth have been worn is apparently very different from the trend in those presenting pathologic conditions about the natural teeth. In both types of human jaws, inflammatory changes are usually found in the bone marrow. That the bone marrow is very susceptible and sensitive to any stimulating influence may be anticipated in the living subject by proliferations seen on clinical examination of the epithelium covering the residual alveolar ridge. The late R. H. Jaffe, who examined many of the sections reported in this work, stated in conference that, in his opinion, "much of the material, objectively considered, suggested a chronic low grade inflammation, as a mild osteomyelitis.

The three cases selected for study were chosen from a large group of specimens because, at the time of death, at 38, 42 and 47 years, respectively, the individuals were of the ages at which prosthetic dental service is usually required. The complement of natural teeth was not present in any case, and many broken down members were present together with clinical signs of occlusal wear and malalinement. The clinical problem

was studied from articulated casts of the jaws and teeth. Roentgenograms were made before decalcification of the specimens. The histologic problem was presented in serial sections of the jaws and teeth which were prepared labiolingually, buccolingually and in a sagittal plane and included the teeth, bone and soft tissues. As is usually true in the clinical accuracy. Such a plan will be pursued in this report for the sake of brevity.

In the right maxilla of a man 47 years old, there were two bicuspid teeth with vital pulps, a central incisor with a periapical abscess and the root of a cuspid tooth. (Fig. 1.) The cuspid tooth presents a granuloma at its apex and a large area of bone destruction. The palatine

Fig. 4.—Structures in baylike depression in buccal cortex at site of sinus above root of right maxillary first bicuspid. FB, free bone with no cellular substance in lacunae. ICT, infiltrated connective tissue surrounding free bone. (× 40.)

condition, both periodontal and periapical diseases prevailed in each of the three specimens. In localized regions, however, the effects of the two conditions may be interpreted with a considerable degree of cortex of the bone in this region is very dense, while along the buccal wall only a thin portion of the alveolar process remains. The bone trabeculae adjacent to the root are literally infested with osteo-

clasts and no evidence of repair is apparent. (Fig. 2.) The bone marrow is densely fibrous. The cellular elements, principally histiocytes, mast cells, plasma cells and lymphocytes, which are characteristic of chronic inflammatory processes, are found throughout the region. Only in the deeper portions of the bone and along the palatine cortex, some fat cells may be found in the bone marrow.

The gingival tissues about the first bicuspid tooth are inflamed. (Fig. 3.) Strong fibrous attachments appear along the lingual root that is supported by compact alveolar bone. The apical one-third of the buccal root is covered only by loose connective tissue. At a point above the apex, a sinus appears. Between the sinus and the apex of the buccal root is a piece of free bone with no cells

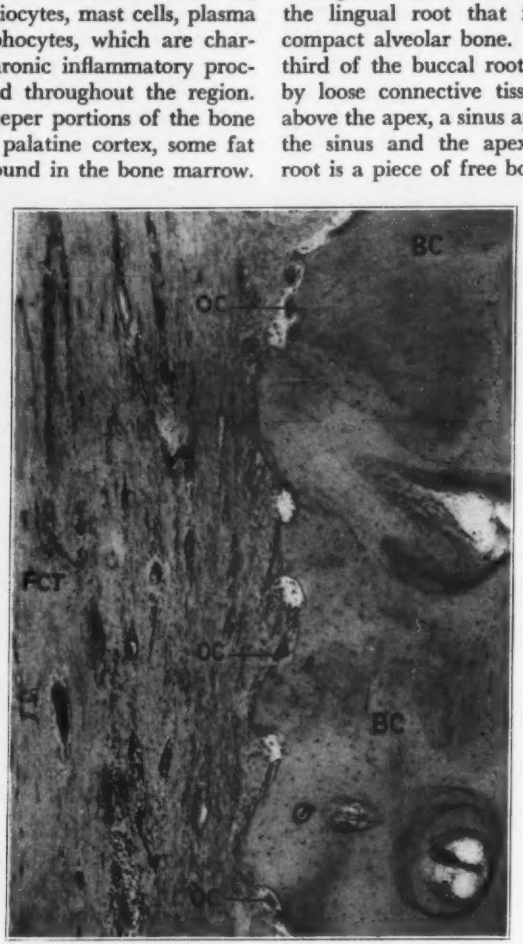

Fig. 5.—Region of buccal cortex and connective tissues typical of structures along buccal wall posterior to cuspid root, indicating progress of inflammation and resorption. OC, osteoclasts lining the bone surfaces. BC, buccal cortex. FCT, fibrous connective tissue. (× 110.)

The blood vessels appear to be in a hyperemic state, presenting a condition which, according to Leriche and Policard, prevails in areas where a transformation such as resorption of bone is in progress.[18]

in its bone lacunae. The connective tissue surrounding it is profusely infiltrated with round cells (lymphocytes). (Fig. 4.)

Resorption is active on the outer surface of the buccal cortex of the alveolar

bone, as well as above the trabeculae; whereas, in edentulous jaws, the process of resorption is conspicuous on the buccal surface and crest of the residual alveolar ridge. The peripheral changes in the edentulous jaw present a striking contrast to those affecting the whole bony framework where the pathologic processes are found about the natural teeth. This variation in the attack of resorption on the alveolar bone under the two conditions suggests the important relation of periapical and periodontal disease to the problem of denture prosthesis.

portions of the bone marrow approximating the walls of the maxillary sinus.

The molar region is edentulous, and notwithstanding its remoteness from the field of active infection in the cuspid region, its bone marrow shows profound traces of inflammatory processes.

Sections from the jaws of a man 38 years of age, who had different types of dental infection, present an interesting picture in the maxillary left bicuspid region. (Fig. 6.) A cyst cavity closely approximating the floor of the maxillary sinus occupied a large area of the al-

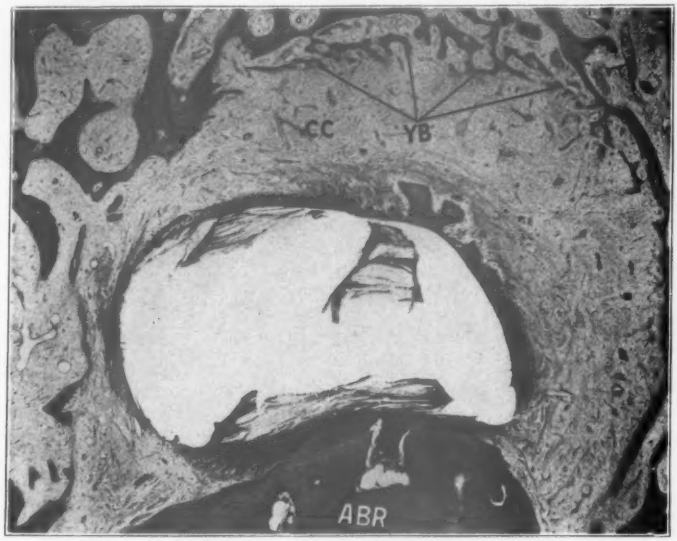

Fig. 6.—Left maxillary bicuspid region from man, aged 38. ABR, apex of buccal root of bicuspid tooth. CC, cyst cavity. YB, young bone at ceiling of cavity. (Kronfeld.) (× 20.)

A frail plate of bone covers the buccal root of the second bicuspid, which also has a vital pulp. However, the palatine cortex appears much thinner than that of the first bicuspid. The resorption of the bone trabeculae appears more pronounced than in the first bicuspid region, and there is great activity of the osteoclasts along the buccal cortex. (Fig. 5.) The bone marrow is extremely fibrous. Fat cells are found only in the deeper

veolar process. It presents evidence of Nature's efforts to repair the havoc wrought by disease, in the form of new bone at the deepest portion of the cavity.

In the molar region on the right side of the arch, the alveolar bone shows the effect of periodontal disease. (Fig. 7.) The bone marrow is so densely fibrous that it cannot be mistaken when viewed microscopically through a low-power objective. It presents very conclusive evi-

dence of chronic inflammation. This section was prepared in a sagittal plane showing the second and third molar region.

Again to emphasize the apparent extensive transmission of periapical and periodontal infection by the blood stream as traced throughout the bone marrow, the bicuspid region of the mandible is shown. (Fig. 8.) The pulp of the first bicuspid tooth was vital. The apex of the second bicuspid root, to which a granuloma was attached, was retained in its shallow socket by dense connective tissue fibers. The deep portions of the bone are very compact throughout, and there is a considerable number of fat cells in the bone marrow. In a region close to the mandibular canal, remote from the inflamed area about the root, inflammatory exudate cells are present in groups along the course of the blood vessels. (Fig. 9.)

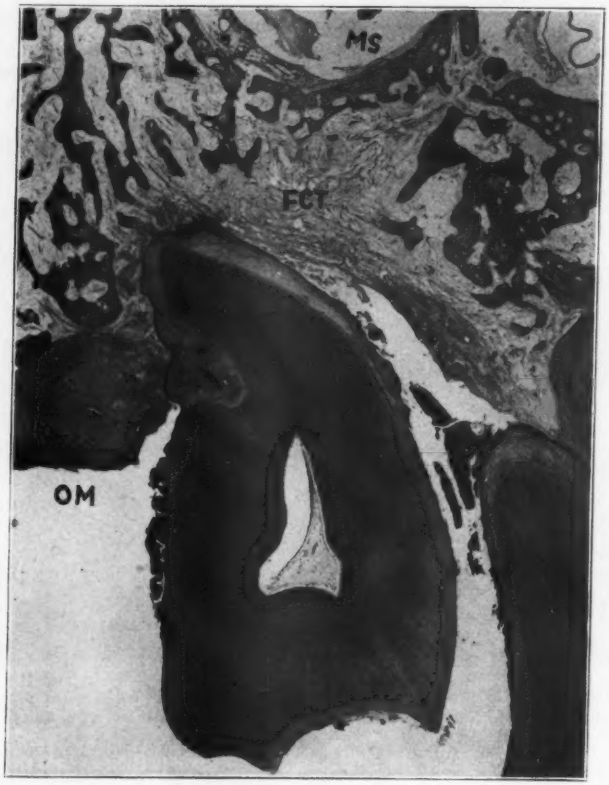

Fig. 7.—Second and third molar region from a man, aged 38; illustrating effects of periodontal disease upon supporting alveolar bone. FCT, fibrous connective tissues in replacement fibrosis about roots of teeth and in bone-marrow spaces. MS, maxillary sinus. OM, oral mucosa. (× 7.)

The jaws from a man 42 years of age present a typical condition of periodontal disease. The third molars were missing, as was the maxillary left first bicuspid and the mandibular right first molar. The

remaining teeth present an average occlusal efficiency, which may be considered above normal for the age, with relatively no caries, but rampant periodontal infection. The apex of the mandibular right third molar remains in the jaw. Gingival inflammation and resorption of the alveolar bone crest prevail.

In the mandibular right cuspid region near the mandibular canal, an area of active blood forming (hemopoietic) tissue is separated from the canal by a thin bony wall. (Fig. 10.) At the superior portion of the canal is an infiltrated fibrous connective tissue substance. The two varieties of tissue in the same en-

Fig. 8.—Bicuspid region of mandible with vital pulp in first bicuspid and granuloma at apex of second bicuspid root. OM, oral mucosa. FCT, fibrous connective tissue about root of second bicuspid. MC, mandibular canal. O, area from which higher magnification is shown in Figure 9. (× 5.)

Throughout both the maxillae and mandible, the bone marrow is fibrous and abounds with inflammatory exudate cells.

vironment present the contrasting picture of blood-forming bone marrow and the fibrosis of chronic inflammation. (Fig.

11.) Recognition of the cellular elements in the two fields might be difficult, but their environment is quite dissimilar. In the active marrow (myeloid tissue), fat cells are present; while, in the inflamed area, only fibrous tissue is found.

In the bifurcation between the buccal roots of the maxillary left second molar, there is evidence of intense inflammation. (Fig. 12.) Resorption is also active in the alveolar bone where a fibrous structure is characteristic of the connective tissues in the medullary spaces. (Fig. 13.) Resorption accompanied by inflammation of the superficial and deep connective tissues (bone marrow) is common in periodontal disease and from both clinical and histologic studies appears to warrant serious consideration.

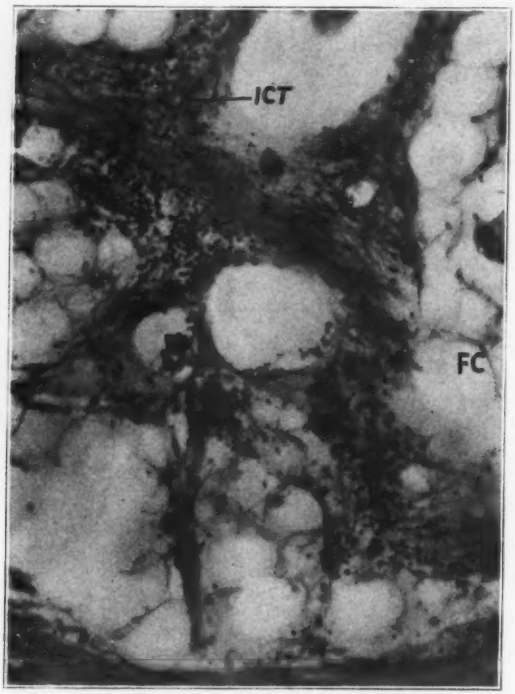

Fig. 9.—Higher magnification of Figure 8 with inflammatory exudate cells in deep portions of bone marrow near mandibular canal. FC, fat cells. ICT, infiltrated connective tissues about blood vessels in fatty marrow. (× 150.)

CONCLUSION

Clinical and laboratory studies lead to the conclusion that the loss of teeth through the inflammatory destruction of alveolar bone is a dominant factor in changes in the human jaws.

Degeneration and regeneration are the sequelae of irritation that causes periodontal and periapical disease. Resorption of alveolar bone can hardly be considered other than the effect of these manifestations about the teeth and, like inflammation, is fundamentally a defensive mechanism in the process of tissue repair.

Whether inflammation and resorption, two conditions omnipresent in periodontal and periapical disease, result in degeneration or regeneration of the tissues affected depends on the intensity, concentration and duration of the irritant,

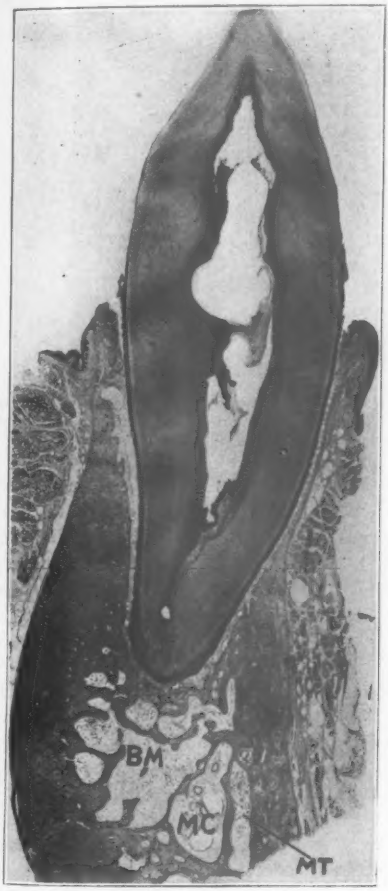

Fig. 10.—Right mandibular cuspid from 42-year-old man. BM, bone marrow in medullary spaces. MC, mandibular canal. MT, myeloid tissue (active blood-forming bone marrow). (× 5.)

together with the physical resistance of the host.

Repair appears to be the exception rather than the rule in periodontal disease. New bone has been observed, after acute inflammation in periapical involvement of human teeth and in edentulous jaws that have supported artificial dentures.

The presence of phagocytic cells along the blood vessels in the bone marrow suggests that the micro-organisms of periodontal and periapical disease pervade these channels. This offers a probable explanation for the widespread inflammation of the tissues observed in these conditions.

The peculiar action of resorption as it affects both the trabeculae and the compact cortical bone in periodontal and periapical disease is contrasted with resorption in edentulous jaws as reported in previous studies.[19] In edentulous jaws, these changes are usually confined to the outer surface of the cortex of the residual alveolar ridge. Repair (young bone) is commonly found along the inner surface of the cortical plate and resorption at its outer surface. These observations provide the basis for the conclusion that the primary changes of a degenerative nature take place before the teeth in human jaws are lost and that the changes in the bone after the jaws become edentulous are probably due to two conditions: residual infection and mechanical injury. The resorption of alveolar bone in edentulous jaws is a negligible factor, as is evidenced by the living cells (osteocytes) in the lacunae.

Clinical records, extending over a ten-year period, at the Chicago College of Dental Surgery, indicate that alveolectomy following the extraction of the teeth is a reliable prophylactic measure against subsequent bone changes in periapical and periodontal disease. Ten per cent of the persons requiring prosthetic service during the period were treated surgically, and the results denote that operation when delayed fourteen to twenty-one days, according to the age and physical condition of the patient, is

a means of aborting extensive atrophic processes in edentulous jaws.

The response of the tissues to surgical treatment may be very accurately determined by their repair. The wound should heal smoothly and the area be ready for impression taking preparatory to the prosthetic construction in about twenty-one days. Other conditions being equal, the tissues may be expected to heal promptly when persons of middle age, those between the ages of 30 and 55 years, undergo alveolectomy fourteen days after extraction. Persons in early life, and those past middle age, seem to respond most satisfactorily to the surgical preparation of the jaw ridges when given a little longer time between the extraction of the teeth and alveolectomy. A lapse of twenty-one days between extraction and alveolectomy usually may be considered a conservative time of treatment in the extreme age limit, for those persons under 30 years or over 55 years.

Fig. 11.—Higher magnification of Figure 10; showing character of fibrous tissues, indicating inflammation and active blood-forming bone marrow in environment of fat cells. FCT, fibrous connective tissue. MT, myeloid tissue. (× 150.)

Fig. 12.—Left maxillary second molar with area of inflammation and resorption between buccal roots. 2, bifurcation between roots and fibrosis characteristic of bone marrow occupying large areas in bone due to resorption. (× 4.)

During the period from June 1, 1937, to May 31, 1938, the percentage of denture patients receiving surgical treatment was 25.42. This increase of more than 15 per cent in the number of operations is due to the results of the first ten years' experience. Delayed operation appears to be a most conservative plan of treating the latent effects of pathologic condi-

tions in edentulous jaws. Follow-up observations of many cases indicate that alveolectomy following extraction is the most satisfactory preparation of the jaws for the reception of artificial denture restorations. If it did nothing more than satisfy the mechanical requirement, which is an important element according to some authorities on physiology, the procedure of alveolectomy would find justification for its practice. It also apparently performs a greater and more important function. On clinical evidence alone, it would seem that delayed alveolectomy stimulates repair of diseased tissues in edentulous jaws. Records over a period of years indicate that changes in the supporting tissues following surgical treatment and the use of prosthetic dentures are negligible.

Fig. 13.—Higher magnification of Figure 12. PR, palatine root of molar. BR, buccal root. FCT, fibrous connective tissue between roots. CI, cellular infiltration in connective tissue. OC, osteoclasts lining surface of bone, indicating progress of resorption. (× 60.)

SUMMARY

Chronic periapical and periodontal disease is accompanied by inflammation of the superficial connective tissues and bone marrow, and by resorption of both the compact cortex and the trabeculae of the alveolar bone. These processes appear as degenerative agents resulting in the loss of the supporting structures and subsequently of the natural teeth. Primary changes in the human jaws seem to precede loss of the teeth. Resorption, not absorption of the bone, appears as the dominant factor in the process.

That residual inflammation prevails in edentulous jaws seems certain. Clinical records indicate that operation following extraction prepares the jaws for the reception of the artificial denture and promotes repair. Atrophic processes are negligible in jaws stimulated by satisfactory artificial dentures. Changes that occur may usually be traced to mechanical injury.

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VITAMIN A AND B DEFICIENCY—AN ETIOLOGIC FACTOR IN ACUTE, SUBACUTE AND CHRONIC VINCENT'S INFECTION AND OTHER DENTAL CONDITIONS

By J. A. Sinclair, D.D.S., Asheville, N. C.

RECENT dramatic results in the treatment of polyneuritis by the administration of massive doses of vitamin B_1, the spectacular response to nicotinic acid in the treatment of pellagra and the newer knowledge of epithelial metaplasia resulting from vitamin-A deficiency have revived the amazing interest in vitamin therapy. Scarcely a medical journal in recent months is without an article dealing in some way with avitaminosis. A partial review of recent articles and an account of our experience in administering large doses of vitamin A and B should be of interest to the dental profession, since subnutritional conditions are reflected in one form or another as lesions in the oral cavity and may be an important etiologic factor in Vincent's infection and pyorrhea as well as in severe and extreme neurologic involvements.

VITAMIN-A DEFICIENCY

The newer knowledge of epithelial metaplasia, the result of vitamin-A deficiency, is the product of experimental studies. The classic experiments of McCullough and Dalldorf[1] demonstrate these metaplastic changes. Of their experiment producing metaplasm, they say:

In a group of eight white rats, a silk thread was passed through the ventral surface of the trachea and tied on the outside. The skin was carefully sutured to eliminate formation of a sinus, and the animals were fed a diet deficient in vitamin A. Controls were a group of animals with a thread in the trachea and on an adequate diet and a group on a deficient diet but without a thread in the trachea.

Tabulated results of their experiment demonstrated that the thread caused regeneration of the tracheal epithelium. The regenerated cells were of the usual character or of the undifferentiated basal type, unless the diet was deficient in vitamin A, in which case metaplastic lesions occurred, by predilection, about the thread. These results suggest that the supply of vitamin A plays a considerable rôle in determining whether simple regeneration or squamous metaplasis occurs about areas of irritation. According to these investigators:

Factors which destroy epithelial cells are usually present in the spontaneous metaplastic lesions seen in man. These most frequently are chronic inflammation and prolonged mechanical irritation.

The question naturally arises whether the spontaneous lesions in man are primarily due to an underlying, if partial, vitamin-A deficiency. Our present results suggest that this is true. Other facts which support this view are, first, that the incidence is highest in patients with chronic debilitating illnesses, in which deficiency phenomena are common; second, similar lesions are common in patients with biliary atresia, in which vitamin deficiency is known to exist; and finally, the

Read before the Section on Periodontia at the Eighteenth Annual Session of the American Dental Association, St. Louis, Mo., October 27, 1938.

lesions are identical with those produced by vitamin-A deficiency.

In their discussion in a recent article, "Specific Dermatoses Due to Vitamin-A Deficiency," Youmans and Corlette[2] write:

> The time required for the eruption to disappear under the influence of treatment with vitamin A is of practical importance. Improvement is seldom noted in less than four weeks and, in many instances, twelve to fourteen weeks are required before the eruption has disappeared. Night-blindness or difficulty in adaptation to darkness, which is also an important diagnostic sign of early vitamin-A deficiency and an index of response to treatment apparently requires only the presence of an adequate supply of vitamin A and can be corrected very quickly. Resolution of the lesions in the skin, which involves a slow process of anatomic repair, takes much longer, and treatment should be continued long after the visual abnormality has been corrected. The slowness of response of the eruption to treatment is also a factor which must be taken into consideration when the response to treatment is used in diagnosis.

Experiments conducted by May Mellanby[3] showed that pyorrhea develops readily in dogs on diets deficient in vitamin A, while on similar diets with this vitamin added the gums remain normal. "The fact that nerves are affected by a vitamin-A deficient diet," she writes, "suggests that possibly diseases of the gums develop in the first place as the result of loss of neurotrophic control and later lead to pyorrhea."

Eddy and Dalldorf[4] write:

> Of recent years it has become obvious that dietary intake alone is not sufficient. Increasing interest attaches, therefore, to the studies of deficient absorption of vitamin A due to gastro-intestinal and hepatic disease, and to increased requirements during periods of rapid growth and of severe infections.

Despite a number of studies, Eddy and Dalldorf[4] feel that the mechanism by which bile facilitates the absorption of vitamin A is still unexplained. That faulty absorption is responsible for these secondary forms of vitamin-A deficiency is shown by the studies of Belgvad in which vitamin A administered intramuscularly, but not orally, cured the symptoms of the deficiency.

From the foregoing, it is obvious that epithelial changes may develop in persons with vitamin-A deficiency when epithelial growth is stimulated by mechanical irritation from fillings, ill-fitting crowns and calcareous deposits resulting in a slow, non-healing or recurring Vincent's infection. Local treatment, therefore, should be directed toward the removal of all mechanical irritants. Massive doses of vitamin A should influence regeneration in normal bacteria-resistant epithelium.

VITAMIN-B DEFICIENCY

The term "vitamin-B complex" as here used applies to the several factors in the water-soluble B complex exclusive of vitamin B_1. The known factors of importance to man are nicotinic acid, riboflavin (vitamin B_2, or G) and perhaps vitamin B_6, according to Spies *et al.*[5]

Symptoms and physical signs of mild vitamin-B deficiency have been ascertained through prolonged study of patients subsisting on a diet of known composition. The changes encountered, Elsom[6] reported, were referable chiefly: "(a) to the gastro-intestinal tract; (b) to the nervous system; (c) to the blood, and, in certain instances, (d) to the cardio-vascular system."

The recent clinical results in the treatment of pellagra with nicotinic acid described by Tom D. Spies, of the University of Cincinnati, in several recent articles, prompted me to write to him regarding his treatment, because of the well-established fact that smoking has a tendency to delay healing in acute Vincent's infection. He writes: "Vincent's infection very frequently occurs along with pellagrous lesions. The organisms decrease after the pellagra has been treated. So far as nicotine and nicotinic

acid are concerned, I can tell you that nicotinic acid is curative for the mouth lesions of pellagra but that nicotine seems to have no effect." It is interesting to note that Spies *et al.*,[7] in their study of fifteen cases with characteristic pellagrous symptoms, used the lesions of the mucous membrane as the criteria of improvement or relapse.

In another recent article, Spies *et al.*[8] observed:

> Within seventy-two hours after the administration of large amounts of nicotinic acid, sodium nicotinate, nicotinic acid amide or coramine to the seventy-three pellagrins, we regularly observed fading of the mucous membrane lesions, blanching of the erythema of the cutaneous lesions when present and a tendency toward the return of normal gastro-intestinal function.
>
> Usually within twenty-four hours, sometimes a day later, there were striking objective changes in the mucosa of the mouth, throat and tongue, and in the rectum. The abnormal redness and the Vincent's infection disappeared.

Of the more recent experiments dealing with mouth lesions associated with dietary deficiencies in monkeys, Topping and Fraser[9] and Tomlinson[10] produced lesions of the mouth from mild gingivitis to complete gangrenous necrosis of the cheek similar in appearance to the lesions in human beings described as "noma." The extreme gangrenous condition was produced by a deficiency of the factors of vitamin-B complex. In the C-deficiency group, severe and more extensive lesions occurred in the gum proper, but the "noma-like" lesions did not occur.

The relationship of vitamin-B deficiency to secondary fusospirochetal infection is further emphasized by Smith *et al.*,[11] who say: "Dogs on the Goldberger diet may be used with confidence in assaying the pellagra-curative value of various substances, because the appearance of secondary fusospirochetal infection is a reliable indicator of the nutritional status."

Riboflavin (vitamin B_2, or G) deficiency in man as described by Sebrell and Butler[12] is of interest to the dental profession. They observe that specific cheilosis (lesions in the angle of the lips) is produced by a diet deficient in riboflavin. This condition has been noted also by investigators in patients suffering with pellagra.

The results of Goldberger's studies of the predisposing cause of pellagra as summarized by Eddy and Dalldorf[4] place the factors which interfere with the assimilation of food, such as loss of teeth, pyorrhea, gastrointestinal disorders, food fads and voluntary restriction of diet, second in importance to economic conditions that affect food supply. It is possible that loss of teeth and pyorrhea, above referred to, are the effect of avitaminosis rather than a predisposing cause.

Irrespective of whether the pellagra followed long-continued ingestion of alcohol, the prompt relief of the spontaneous pain of neuritis by the intravenous injection of crystalline vitamin B_1 was striking in all cases taken care of by Spies and Aring.[13] Nicotinic acid by mouth, used in three cases, completely relieved the severe stomatitis and glossitis and promptly produced healing of all the lesions of the mucous membranes.

> In both of the "endemic" cases and in one of the "alcoholic," administration of nicotinic acid caused healing of the mucous membrane lesions within twenty-four hours, but apparently did not affect the pain and numbness from the peripheral neuritis. These symptoms subsided rapidly, however, on injection of 50 mg. of thiamin chloride (vitamin B_1) on two successive days.[13]

These findings suggest that the painful peripheral neuritis in these particular cases was caused, at least in part, by a lack of vitamin B_1.

In speaking of the involvements of the nervous system, Williams and Spies[14] say:

> The most constant and striking symptoms of a vitamin-B_1 deficiency arise from degen-

eration in the nervous system. It is characteristic that the distal portions of the nerves are first and most seriously altered. In far-advanced cases, all nerves of the body may be involved. All observers agree that there is microscopic evidence of degeneration in the peripheral nerves which may vary from slight alteration to complete disappearance of the myelin and axis cylinders.

The observations of Spies and Aring[13] suggest that certain patients fail to absorb vitamin B_1 effectively by mouth, and it is imperative that they be given parenteral injections, which aid in shortening convalescence and are desirable from the standpoint of prompt relief of pain.

That vitamin deficiency may be influenced by factors other than intake is shown by Elsom[6]:

> Certain patients who preoperatively showed few or no signs of vitamin deficiency developed frank deficiency following operation. Fever increases the vitamin-B requirement and in an individual whose vitamin intake has for any reason been impaired prior to operation, fever occurring postoperatively may result in a very rapid development of deficiency, particularly if the intake of food is inadequate during this time. We have noted that patients with achlorhydria frequently show evidence of deficiency even when the dietary intake is adequate.

According to Stern,[15] a depletion of vitamin B_1 takes place very rapidly on a diet high in sugars and starches.

Riboflavin (vitamin B_2 or G) deficiency is also involved in the neurologic manifestations by marked degeneration of the medullary sheaths and axis cylinders of the peripheral nerves, according to the experiments of Hogan.[16]

The possibility that the diet deficient in vitamin B_1 may be reflected dentally was suggested in experiments with rats carried on by Lee and Sure,[17] in which the most regular and marked degeneration of myelin was found in the trigeminal and sciatic nerves. The degree of degeneration in most cases corresponds to the number of days that the rats were on the deficient diet. The nerve fibers from animals with mild paralysis were swollen, with practically no degeneration of myelin, while those from animals with marked paralysis showed degeneration of myelin and breaking of many of the axis cylinders.

In administering large doses of vitamin-B complex, which contains vitamin B_1, I have regularly noted the disappearance of the extreme hypersensitivity of the dentin to instrumentation and thermal changes and also of the soft parts to instrumentation and to the hypodermic needle.

VITAMIN A AND B DEFICIENCY

A disease which has been reported in various parts of the world and which expresses itself in dimness of vision (day-blindness), sore mouth with smooth, glazed tongue and eczematous lesions of the vulva, scrotum or anus has been described by Wright[18] as polyavitaminosis. Peripheral nerve lesions occur, and conjunctivitis and keratosis similar to that seen in vitamin-A deficiency are encountered. Night-blindness is absent, but retrobulbar neuritis is frequently seen.

The strongest evidence that this condition is due to deficiency of vitamins A and B, according to Eddy and Dalldorf,[4] is that treatment with either separately gives indifferent results, while treatment with both, in combination, is very beneficial.

In vitamin-A deficiency, according to Vorhaus,[19] a loss of the physiologic integrity of the various epithelial structures occurs, aiding invasion of bacteria, while vitamin B is essential for the normal metabolism of nerve tissues.

Alcohol addicts with polyneuritis, Goodhart and Jolliffe[20] point out, are not on a diet deficient alone in vitamin B and therefore other deficiencies complicate the picture. For example, it has been demonstrated by men in this work that vitamin-A deficiency may be responsible for a peripheral neuritis.

Jolliffe *et al.*[21] state:

Animals maintained on a diet deficient only in vitamin A require long periods of inadequacy before neurologic signs or symptoms become manifest. Conversely, animals deficient in vitamin B_1 develop neurologic changes relatively early.

This indicates that vitamin A is involved also in neurologic conditions.

According to Williams and Spies,[14]

Varying periods of time are required for the different elements in the nervous system to regain their normal function. The rapid initial recovery is due to a return of function of the nerve cells, whereas the subsequent slow progress is associated with the remyelinization of the nerve fibers.

Mellanby[22] is of the opinion that the initial prompt response is due to vitamin B_1 and that the subsequent slower healing is dependent upon vitamin A.

Regarding vitamin-A and vitamin-B deficiency, Smith and his collaborators[11] find, from their experiments in producing black tongue in the dog, that vitamin-A deficiency is probably the significant factor in the Underhill syndrome. The use of two entirely different deficient diets in the same laboratory gives convincing evidence that the clinical pictures of Goldberger's experimental black tongue and the Underhill syndrome are identical. Bacteriologic findings were also identical. Fusospirochetal organisms were demonstrated in enormous numbers in the oral lesions occurring in dogs with each of the two types of dietary deficiency studied.

In many recurring, subacute and chronic Vincent's cases, as well as in numerous cases of pyorrhea in which prior orthodox methods of treatment had failed, or partially failed, the administration of large doses of vitamins A and B together with cevitamic acid has had many gratifying results, some of them dramatic.

I have given vitamins in conjunction with treatment in re-treating many cases that failed to respond to any of the outstanding treatments and, in each case, results were obtained that more than justified the addition of vitamin therapy. Dramatic results have been noted in many cases in which vitamins B and C were administered together.

Of especial interest is the history of one case. Surgical treatment had been rendered by a competent dentist, but the lesions failed to heal properly and electrocoagulation was used without results. A second dentist advised the extraction of the teeth, which were in such a condition that he advised extraction of only one or two at intervals of ten days or two weeks. Under repeated prophylaxis without either surgical or subgingival treatments and with the addition of a high dosage of vitamins B and C, this case has responded beyond expectations.

There are other clinical results of vitamin therapy that should be of interest. As stated above, sensitiveness to instrumental and thermal changes was greatly reduced and, in some cases, completely relieved by vitamin B_1 therapy. The extreme sensitiveness of the soft parts to instrumentation and the use of the hypodermic needle is also relieved.

The importance and the place of vitamin-C deficiency should not be overlooked. One feature, the lack of intercellular substance and collagenous white fibers in vitamin-C deficiency, suggested its possible use in cases of subluxation. Two patients have been relieved of this condition completely, on administration of 150 mg. of cevitamic acid daily for thirty days. Too small a number have been treated to justify conclusions.

DIAGNOSIS

Vitamin-A deficiency is indicated by the dietary history and is determined by the optical adaptation time and a microscopic examination of the epithelial scrapings for evidence of keratinization.

The photographic substance in the eye that enables us to see light is visual purple. It is destroyed by light, but is constantly regenerated from the available vitamin A in the system. A normal

amount of vitamin A regenerates visual purple after exposure to bright light. In a case of vitamin-A deficiency, the ability to regenerate visual purple is not lost, but delayed, and it is claimed that the first sign of vitamin-A deficiency is the inability to regenerate visual purple at a normal rate, resulting in a condition known as "night-blindness."

Vitamin-B_1 deficiency is indicated by the dietary history and symptomatology. Its absence is known to cause disturbance of nerve function which results in pain. The chief deficiency symptoms and signs are: anorexia, peripheral neuritis, gastrointestinal disturbances (achlorhydria and intestinal hypotonicity), retarded growth, vasomotor symptoms (heart palpitation, dyspnea and enlargement of the right side of the heart), polyneuritis and beriberi.

There is no special clinical test available for determining a vitamin-B complex deficiency. In the dietary history and symptomatology, the lesions of the mouth and oral mucosa are outstanding.

DENTAL DIAGNOSIS

In vitamin-A deficiency, the mucous membrane and the tongue are pale and anemic looking. The tongue is usually smooth and unglazed. In advanced pyorrhea accompanying vitamin-A deficiency, there is no drifting of the teeth, traumatic occlusion is not outstanding and bleeding of the gums is slight, if present at all. These conditions are the opposite to those found in vitamin-C deficiency where drifting of the teeth and bleeding of the gums and mucous membrane are noted. The gums and tongue, in extreme conditions, are bluish red or fiery red. Traumatic occlusion, due to the drifting of the teeth, and bleeding of the gums are outstanding features of this deficiency.

In vitamin-B complex deficiency, the tongue is often smooth, red and glazed. Lesions are slow in healing following the treatment of recurring Vincent's infection and pyorrhea. Vitamin-B_1 deficiency is indicated by the extreme sensitiveness of the soft parts, especially to the hypodermic needle. Hypersensitive dentin and exaggerated response to thermal changes may be encountered.

The presence of chronic Vincent's infection and the slow response or non-response to orthodox treatment of pyorrhea lesions are highly suggestive of a deficiency of one or more vitamins.

My experience strongly suggests that a multiple deficiency is responsible for the conditions described by Gottlieb as "diffuse atrophy of the alveolar bone"; by Box, as "complex periodontitis," and by Beck, as "genuine paradentitis."

It is generally conceded that, owing to absence of symptoms, many cases of subclinical avitaminosis are not recognized. To overcome this diagnostic difficulty, I have used the "trial and error" procedure in dealing with dental lesions suspected of resulting from dietary deficiency. In fact, I am now giving vitamin-A and vitamin-B complex as a prophylactic precaution when treating cases of pyorrhea and acute, subacute and chronic Vincent's infection.

DOSAGES

In the treatment of vitamin-A deficiency, at least 50,000 international units of vitamin A are given each day for a period of thirty days. This dosage is reduced to 25,000 international units for the next thirty days or for a somewhat longer period.

Vitamin B and G capsules are used in treatment of vitamin-B deficiencies in dosages of 4 to 6 capsules a day, which supplies from 600 to 900 international units of vitamin B_1 and from 600 to 900 gammas of riboflavin (B_2, or G) besides other factors of the B complex. This dosage is prescribed for thirty days, at the end of which time the dosage is reduced to one-half the former amount and is to be taken for an indefinite period.

In advanced cases, 100 mg. of nicotinic acid and 10 mg. of thiamin chloride (vitamin B_1) are given each day for ten days, in addition to the vitamin-B complex.

Vitamin-C deficiency is readily corrected by prescribing 200 mg. of cevitamic acid per day for ten days, followed by 100 mg. per day until clinical evidence has disappeared.

CONCLUSIONS

The observations here described seem to confirm the opinion that the number of subclinical avitaminosis cases may be very large. It would seem that clinical and subclinical cases may have a direct relationship to pyorrhea and acute, subacute, chronic and recurring Vincent's infection.

These observations suggest that extreme polyavitaminosis with or without local precipitating factors may produce the condition described by Gottlieb as "diffuse atrophy of the alveolar bone," by Box as "complex periodontitis" and by Beck as "genuine paradentitis."

Lack of vitamin B_1 or of vitamin A may be involved in the extreme sensitiveness of the roots of the teeth to instrumentation and abnormal thermal response, as these conditions often cease with vitamin therapy.

From the literature and my own experience, it has been found that large doses of the deficient vitamins are required to reestablish the normal vitamin content of the body.

In view of the present advance in knowledge of vitamins, especially of the chemistry of vitamin-B complex, additions have been made to this paper in order to bring it fully in line with the results of more recent investigators.

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ORTHODONTIC PROBLEMS WHICH INVOLVE THE OPERATIVE DENTIST

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THE operative dentist is probably most interested in orthodontic problems in treatment, either preventive or otherwise, that will be of real service to the patient. Such service is often possible, frequently with the aid of very few or no appliances. Orthodontic treatment does not always consist of the construction of complicated mechanical appliances. The operative dentist is also interested in those problems in which the orthodontist and he will work together, the orthodontist doing his work first to aid the operative dentist in doing satisfactory restorative work.

GROWTH AND DEVELOPMENT

The operative dentist has, at times, possibly seemed to feel that the orthodontist has some secret of appliance construction or manipulation that he is afraid to pass on to the general practitioner. Such is not the case, or at least it should not be. The technic of appliance construction is no more difficult than that of other types of dentistry. However, one reason that it has been difficult for the orthodontist to pass information on to the operative dentist is that, in the past, the undergraduate curriculum has not allowed the time for training in the essentials of orthodontic diagnosis, indications for treatment, appliance construction and the manipulation of the appliances after construction. Neither has it allowed time for the study of growth and development, and most general practitioners have not found much time for such study after graduation from dental college. This presents another obstacle to the orthodontist in giving the operative dentist the aid he might desire, since most orthodontic treatment is closely linked to growth and development. In fact, many of the orthodontist's problems concern growth and development. The operative dentist may think that all there is to the treatment of a certain case is the mechanical phase of constructing an appliance to bring about certain tooth movements; but, very often, the cause of the condition is deep seated and far more involved and intricate than the mere construction and manipulation of an appliance, and this fact often cannot be ignored, as it has a definite relation to treatment and prognosis. Dr. Mershon, a man of long and varied experience in general dentistry as well as orthodontics,

Read before the Section on Orthodontia at the Eighteenth Annual Session of the American Dental Association, St. Louis, Mo., October 26, 1938.

once said: "It requires infinitely more skill and more judgment, and greater knowledge to know when and how to use an orthodontic appliance than to make one."

Most operative men are not particularly interested in the study of orthodontic problems, nor do they always have the time for such an interest. They are not interested in growth and development to any great extent; although it appears that one cannot safely go very far into orthodontic treatment without at least a fair knowledge of growth and development in general, and particularly that of the teeth and jaws. This knowledge can be acquired to some extent by careful clinical observation of conditions in the mouths of children of all ages, and this has been accomplished to quite a great extent by many dentists. A great help, however, in acquiring it more accurately and definitely is study of individual series of models of children's teeth made from good impressions taken about one year apart. Series started at 3 or 4 years of age and carried on to about 12 years of age show the exact conditions in the deciduous dentures during their terms of function, and the changes incident to growth and development during the transition from the deciduous to the permanent dentition. Unless one has a clear conception of these changes, he is very apt to go far astray in any attempt at diagnosis and treatment.

Fig. 1.—Normal growth and development of deciduous and permanent dentitions.

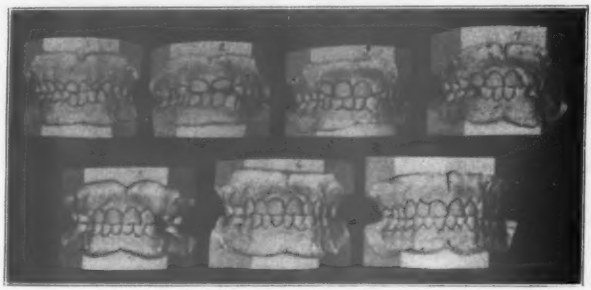

Fig. 2.—Variations in normal growth and development of deciduous and permanent dentitions.

In studying such series, one will sooner or later meet some of the problems to be discussed. It is true that some

of these cases will prove to be normal. A good percentage will, without any orthodontic treatment, develop into normal adult dentures, or at least the occlusion will be satisfactory, if sufficient time is allowed. This result is always gratifying. It will be attained sometimes without any marked irregularity in developmental processes. At other times, quite marked irregularities will appear, but, with further growth and development, they are partially or entirely eliminated, and ultimately Nature produces a satisfactory occlusion. We are here recognizing that normal occlusion does not mean a perfect or an ideal arrangement of teeth, but may include some variations and irregularities. It is probably true that, in some cases, the occlusion cannot be classified as normal, and yet is considered satisfactory. This can be true in spite of the fact that no teeth in abnormal occlusion can function as well as those in normal occlusion.

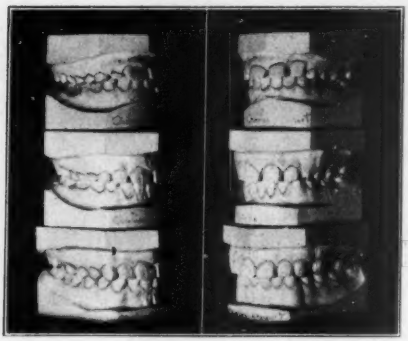

Fig. 3.—Unexpected in growth and development of a permanent dentition.

In going over many series of models demonstrating growth and development, it becomes evident that it is never possible to predict with certainty at any period of development just what the end-result will be. In general, the cases that are normal or nearly so have the better chance to develop into a normal adult denture; but there are no hard and fast rules, and at times the unexpected happens.

Figure 1 shows a case of normal growth and development. At no time during development was there any cause for alarm.

In Figure 2, the case did not develop quite so smoothly. For a period, there was some space between the upper central incisors, and there were other slight irregularities, such as the crowding of lower incisors; but, in the end, the adult denture is normal. Many cases show some spacing between the upper central incisors for a time, but, as a rule, the space is eliminated with further growth and development.

Fig. 4.—Typical face of mouth breather.

Figure 3 demonstrates that occasionally the unexpected does happen. The figure represents right and left views of three stages in the observation of the same patient. In the first stage, shown at the top, there is presented an abnormal occlusion with the upper right lateral incisor locked lingually. Ordinarily, this condition is not corrected without assistance of some kind, but, in this case, natural growth and development corrected the condition. Consequently, the second stage, shown in the center, presents a normal occlusion and one so good

that the operator might be tempted to predict a fine result. However, again the unexpected happens; and again, in the last stage, shown at the bottom, there is an abnormal occlusion in which treatment of the upper and lower left first premolars was required. The treatment consisted of banding those two teeth and using intermaxillary elastics from a hook on the lingual surface of the lower band to another on the buccal surface of the upper band until the teeth were in normal occlusion.

HABITS

In close clinical observation, one very soon learns to detect undesirable habits, and a series of models shows the results, usually also undesirable. Here is a real problem, the elimination of these habits, a problem that the operative dentist should be aware of and keenly interested in because he invariably sees the patient at a younger age than the orthodontist does. Many times, these habits can be eliminated, and the results are very gratifying and worth while.

If we study the faces of our child patients, we find many of the type shown in Figure 4. In this type, the lips are open, with the upper incisors showing, and the nose is narrow, with nearly closed nostrils. There is a very low muscle tone of the whole face. Various types of malocclusion are found in association with this typical face of the mouth-breather. Many times, there is no nasal obstruction, the mouth-breathing being purely a matter of habit. Special effort should be made to detect these cases early, to learn whether the nasal spaces allow free air passage, and, if so, to correct the abnormal habit. It can be accomplished through education of the patient, through breathing exercises and sometimes with the aid of lip taping at night. Correction of such a condition will improve not only the teeth, but also the patient's general health and appearance all through life. Is it not a most valuable service?

Another undesirable habit and one that is usually very difficult to detect is that of tongue sucking. The first models in Figure 5 show a case where detection was possible, and the second and third models show the improvement three months and one year later, respectively, after discontinuance of the habit.

Thumb-sucking and finger-sucking are habits which the dentist detects probably much more frequently than any others.

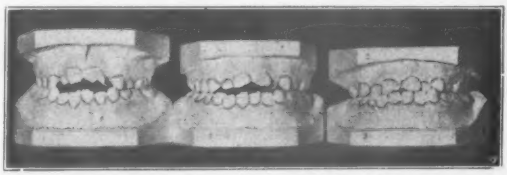

Fig. 5.—Result of tongue habit, and improvement following elimination of habit.

The usual harmful results are quite familiar to all. Also, considerable evidence has been presented in the past to show that although the harmful results gradually disappear with complete elimination of the habit, they persist as long as the habit continues. Abnormal lip habits are also quite common and sometimes influence the positions of the teeth. All of these habits are important, and complete elimination of them, if possible, is always desirable.

PARTIAL IMPACTION OF FIRST MOLARS

A problem of common interest that the operative dentist is likely to see before the orthodontist is the partial impaction of the first molars, usually the upper, as they are erupting. Such conditions may need treatment by careful

forcing of a curved piece of 0.020 brass wire above the contact point of the first molar and the second deciduous molar, the ends then being drawn tight and twisted together at the distal embrasure of the second deciduous molar. The wire ends can be so placed as not to irritate the cheek or tongue. The wire may be tightened every two weeks until the tooth is released and farther erupted. Rarely, the first molars are placed so far mesially that the roots of the second deciduous molars are completely destroyed before any portion of the first molars is through the gums; which necessitates the extraction of both second deciduous molars and eliminates the possibility of such treatment.

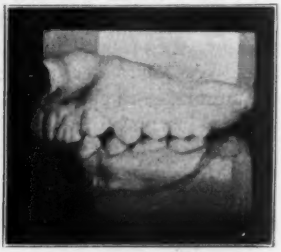

Fig. 6.—Too long retention of lower left second deciduous molar.

TOO LONG RETENTION OF DECIDUOUS TEETH

Another problem of common interest is the too long retention of deciduous teeth. Trimming or extraction of deciduous teeth is often indicated to prevent a developing malocclusion. Extraction is used when the succeeding permanent tooth is ready to erupt and trimming when the succeeding tooth has not developed to that point. Figure 6 shows the too long retention of a lower left second deciduous molar, which is keeping the first permanent molars in an end-to-end relation. As the roentgenogram in this case shows the second premolar ready to erupt, the treatment was extraction of the deciduous molar, letting the lower first molar shift into its proper relation with the opposing tooth. This end-to-end relation of the first molars is normal in many cases up to this period of development, but with the shedding of the lower deciduous second molars, the first permanent molars shift mesially in their relation to the upper.

Figure 7 shows a case presented some time ago by Lloyd S. Lourie. The upper left first premolar was crowded and forced lingually, and three teeth in front of it were held too far mesially, as shown in the upper and lower models on the left, occlusal and buccal view, respectively. This condition existed because the second deciduous premolar was still in place. The roentgenogram of the upper teeth showed a delayed development of the second premolar; therefore, the treatment consisted of disking the mesial surface of the deciduous second

Fig. 7.—Dr. Lourie's case showing delayed development of second premolar, and method of trimming deciduous molar.

molar as shown in the roentgenogram of the lower teeth. The roentgenogram and the upper and lower models to the right show the improved condition resulting from this trimming.

The upper roentgenogram in Figure 8 shows the trimming of the upper second deciduous molar to allow the first premolar to shift into a better position, and trimming of the distal aspect of the lower second deciduous molar to allow the first molar to improve its position. The lower roentgenogram shows the improved positions four months later. In all cases where caries was present, the patient was advised of the fact and asked to have the operative dentist restore the teeth properly.

Just a word of caution here regarding trimming of permanent teeth: It is never done as is suggested here for the deciduous teeth. Permanent teeth should never be trimmed unless one is positive that this is the right procedure. Also, some one might say that the trimming of deciduous teeth is unnecessary and that Nature alone will solve the problem. Many times, that is true, but it is also true that sometimes we have quite delayed development of permanent teeth, and so it seems wiser to have models and roentgenograms and to treat the condition according to indications in the particular case.

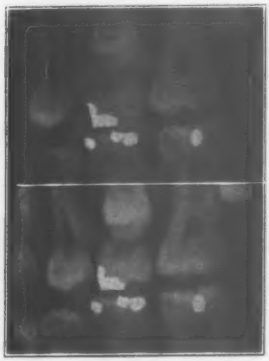

Fig. 8.—Roentgenogram showing trimming of both upper and lower deciduous molars.

Fig. 9.—Roentgenogram showing four supernumerary teeth in upper incisor region.

Fig. 10.—Models of case in Figure 9, showing original condition and improvement after removal of supernumerary teeth.

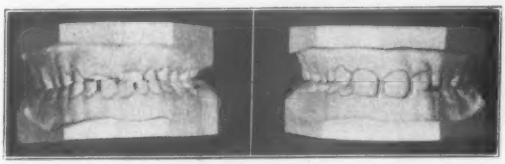

Fig. 11.—Case of upper central incisors in lingual occlusion, before and after treatment.

SUPERNUMERARY TEETH

Supernumerary teeth present problems that involve the operative dentist and, many times, the orthodontist. In Figure 9, there are four such teeth in the upper incisor region, two labially to the lateral incisors, and two lingually to the central incisors. Treatment here consisted of removing the four supernumeraries, and in Figure 10 are three models showing the resulting improvement. No appliances were used. It is well to beware of supernumerary teeth where tooth arrangements are as shown in the first of the three models.

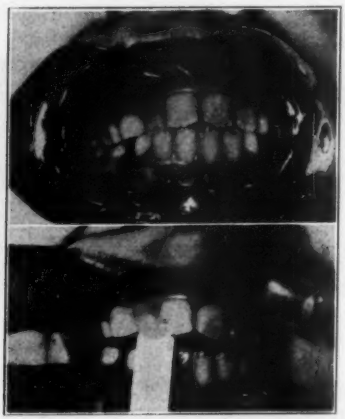

Fig. 12.—Method of correcting condition similar to that shown in Figure 11.

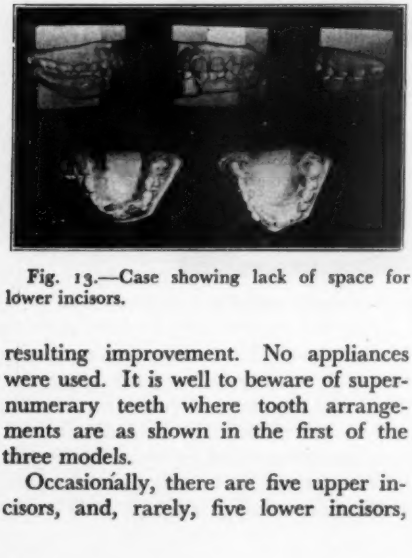

Fig. 13.—Case showing lack of space for lower incisors.

Occasionally, there are five upper incisors, and, rarely, five lower incisors, usually two lateral incisors on one side. The condition may exist in both the deciduous and the permanent denture or in just one of them. The x-rays are employed to learn more regarding the teeth and their root formation and development, and observations are made to determine how and when to treat. With this knowledge, it is possible to treat some such cases by the extraction of one of the two lateral incisors, the one that appears to be more normal being left.

Quite often, one or more of the upper anterior teeth bite lingually to the lower as they erupt into occlusion. Figure 11 shows such a case before and after treatment. We should watch for this condition in the children of our practice. If we discover it before the teeth are locked by a deep overbite, the simple treatment of biting on a tongue depressor will correct it. Figure 12 shows the method of using the depressor. The child is taught to bite against it in this manner forty or fifty times before meals and before going to bed. Very soon, it will be possible for the patient to eat his meals with the teeth biting in their new positions. With the diligent cooperation of the

Fig. 14.—Relative positions of developing permanent incisors.

patient, desirable results are possible in some such cases in spite of a deep overbite.

EXTRACTION OF DECIDUOUS TEETH

Whether to extract deciduous teeth to correct crowded tooth conditions is sometimes a problem. Occasionally, we find that a deciduous lateral incisor has been extracted to make space for a permanent central incisor or that a deciduous canine has been treated likewise to make space for a permanent lateral incisor. Figure 13 shows a case with the lower lateral incisors quite far lingually. Some one might be tempted here to extract the lower deciduous canines. Such extraction would be a mistake because it would simply be robbing Peter to pay Paul. Where is the succeeding canine going to erupt if we use its space for the lateral incisor? Likewise, where is a lateral incisor going to erupt if its space is used for the central? The best rule is to extract a deciduous tooth if the succeeding permanent tooth is ready to erupt and take its place at once or in the near future. There are very few exceptions to this rule.

Also, there is not so much cause for alarm when some of the teeth erupt lingually, unless the positions are very extreme, because the permanent teeth grow and develop in positions lingually to the roots of the deciduous ones as shown in Figure 14. Some of the teeth erupting in a lingual position show a marked tendency to improve with further natural growth and development.

The problems thus far have been those that might be treated by the operative dentist; or he and the orthodontist might work together in their solution. Figure 15 shows a condition in which the orthodontic treatment is completed first to facilitate the restorative work. The models above show the extreme posterior relation of the lower series of teeth to the upper series, with the very narrow upper

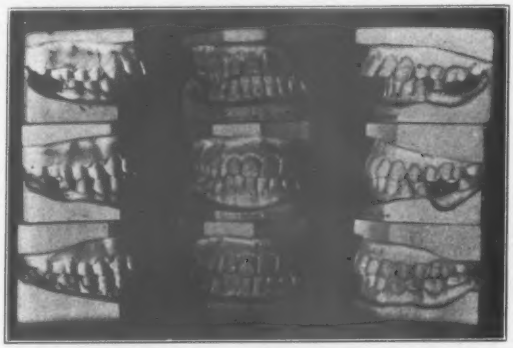

Fig. 15.—Above: Models showing malocclusion before treatment. Center: Models showing occlusion after treatment. Below: Models showing occlusion after restoration.

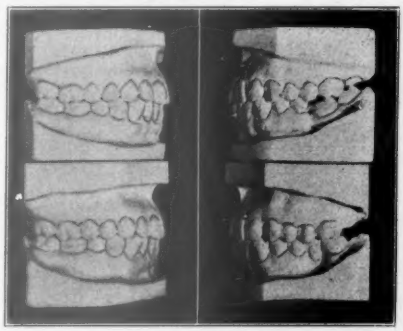

Fig. 16.—Above: Models showing original occlusal conditions. Below: Models showing occlusal conditions after orthodontic treatment and bridge restoration.

dental arch and the badly protruding upper incisors, this condition being complicated by the extraction of the first and second molars on both sides of the lower jaw. The second models show the occlusion at the end of treatment; the third ones, with the restoration in place.

Figure 16 is another case in which orthodontic treatment was completed first. The first models show very good occlusion, except in the left molar region. Here, the lower first molar had been extracted and the second and third molars had drifted and tipped mesially, bone mesially to the second molar in the last roentgenogram. The alveolar process has been built up remarkably at the mesial aspect of these roots.

Similar treatment can hardly be practical for and recommended in all cases of tipped molars. However, this case was very satisfactory and, with great care and judgment in the selection of cases, it certainly seems a practical procedure in at least a limited number of patients.

There are, of course, other orthodontic problems that involve the operative dentist. Two important ones omitted are

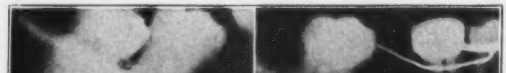

Fig. 17.—Roentgenograms showing changes in alveolar structure during orthodontic treatment.

as they often do, as a result of a first molar extraction. The lower third molar was extracted because it had a large filling and was a somewhat doubtful tooth. The second molar was then tipped distally and the restoration made as is shown in the second models. The series of roentgenograms made during the treatment period (Fig. 17) are an interesting study of alveolar structure. Of particular note is the improvement in the space maintenance after the premature loss of teeth and the problem of congenitally missing teeth. Considerable material is found in the literature on both of these subjects and both require too lengthy discussions to be included at this time.

The solutions offered for the problems that have been discussed are thought to be rational and sound, and have been thoroughly tested in practice.

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PULP STONES AND DEVITALIZED AND IMPACTED TEETH AS A FACTOR IN SYSTEMIC DISEASE

By JOHN W. SEYBOLD, D.D.S., Denver, Colo.

LABORATORY findings plus clinical observation, in my practice, leads me to believe that modern dentistry is a factor in systemic disease, especially the degenerative diseases of middle life. I believe this to be due to the universal practice of retaining so-called x-ray negative teeth as a foundation for dental appliances. I have reference to teeth carrying pulp stones, pulpless teeth, devitalized teeth with root-canal fillings and impacted teeth, especially those that have no communication with the oral cavity.

If a mouth, on x-ray examination, shows no radiolucent areas and no localized soreness of the teeth is complained of, the diagnosis is negative.

Four years ago, in an extemporaneous talk before the American Society of Oral Health, I stated that there was, in my opinion, no such thing as a sterile or harmless devitalized tooth, since all I had extracted and cultured were infected, regardless of what the x-rays revealed or how well the roots were filled. At the same meeting, I first expressed my belief that all teeth carrying pulp stones were infected.

These statements were based upon bacteriologic examinations made for me by Otto S. Kretschmer, M.A., M.D., clinical pathologist of Denver. We later published a paper[1] entitled "The Bacteriology of Dental Pulp Stone Teeth."

Since publication of this paper, Tunnicliff[2] and Logan[3] have stated that they were unable to find histologic evidence of infection and therefore our bacteriologic findings were questionable.

I am deeply indebted to Dr. Kretschmer for his sustained interest and willingness to work on a dental problem without compensation. It is because of this that I am now able to show pathologic tissue changes in the pulp of a vital tooth bearing a pulp stone. (Figs. 1, 2 and 3.)

I have stated that I do not think that such a thing as a sterile or harmless devitalized tooth exists. Kronfeld[4] says, "It might be possible to sterilize an infected tooth, but is improbable."

We formerly believed that the tubuli radiating outward from the pulp chamber and root canal were filled with a jelly-like substance (colloidal). Now we know that they contain dentinal fibrils, as shown in Figure 4. It is my belief that these tubuli become infected and these organisms throw off their toxins through the external openings (Fig. 5), and into the circulation by way of the peridental membrane, especially in the areas marked cc in Figure 6, known as the granular layer of Tomes.

These tubuli are microscopic and yet large enough to admit from six to ten streptococci abreast, so to speak.

Churchill[5] believes that devitalized teeth are retained in the jaw by a chemical interchange, made possible by the porosity of the roots. These roots being bathed with tissue juices circulating in the peridental membrane, molecules of calcium phosphate are carried into this

Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 25, 1938.

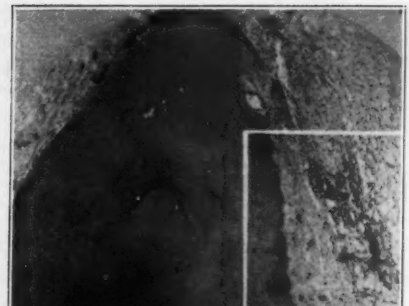

Fig. 1.—Photomicrograph showing small pulp stone (1 mm. diameter) with area of leukocytic infiltration enclosed by white lines, together with other evidences of pulp atrophy; i. e., fatty degeneration and fibrosis. (Zeiss Homal, No. 10 Apoc.) (Kretschmer.)

Fig. 2.—Part of area within white lines in Figure 1; stained with Gram's stain and photographed through oil infiltration; margin of pulp stone seen in dark area. (Kretschmer.)

Fig. 3.—Higher magnification of area within white lines in Figure 1; showing margin of pulp stone to left with fibrosis immediately adjacent and some fatty degeneration surrounding area of leukocytic infiltration. (Kretschmer.)

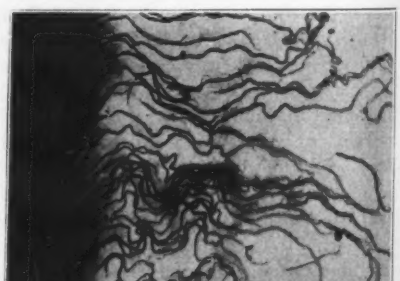

Fig. 4.—Dentinal fibrils partly isolated. To the right, fibrils freed of matrix and floating in liquid. To the left, fibrils still occupying dentinal tubules. (Fuchsin stain; magnification about 400 diameters.) (Churchill.)

structure, or withdrawn according to the calcium and phosphorus concentration of the blood. When the peridental mem-

brane is destroyed, as in the later stages of pyorrhea, the tooth is sequestrated.

Regarding the question whether deeply embedded or impacted teeth that have no communication with the mouth are infected, I personally cannot say, as I have not had one cultured. Lucas[6] reports a series of more than 500 cases cultured and reports that he invariably found streptococci, usually the viridans type and occasionally hemolytic. Knowing Dr. Lucas to be a careful operator, I have accepted his findings.

My clinical experience is that the neurologic aspect is a dominant factor, and therefore I feel doubly justified in advising the removal of all impacted teeth.

J. A. Kolmer,[7] professor of medicine in the medical and the dental school of

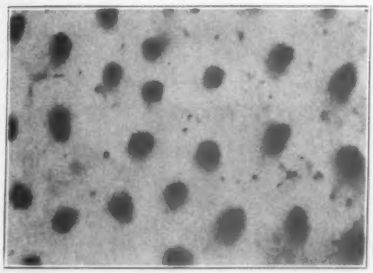

Fig. 5.—Cross-section through dentinal tubule near boundary between peripheral and middle thirds of dentin. (Schmorl stain; magnification about 2,000 diameters.) (Churchill.)

Temple University, cites seventy-five systemic diseases due in whole or in part to secondary dental infection, consisting of various diseases of the skeletal system, the cardiovascular system, the blood and blood-making organs, the kidneys, the gastrointestinal tract, the respiratory tract, the nervous system, the eyes, the ears and the skin.

The foregoing is a formidable array of systemic diseases originating in our chosen field, and, as guardians of the oral cavity, we have a great responsibility.

When a physician requests the family dentist to examine a patient for hidden foci of infection, he is recognizing that dentist as a professional man, and he has a right to expect a diagnosis based upon the application of the basic sciences, not upon mechanics or the absence of localized pain and soreness. The physician knows nothing of mechanics and cares less, for he recognizes that the teeth are definitely a part of the body and nourished by a common blood and lymph stream.

Our profession, as a whole, should have sufficient knowledge of clinical medicine to be able to recognize lesions of the mouth that are secondary manifestations of systemic disease. The dentist should by

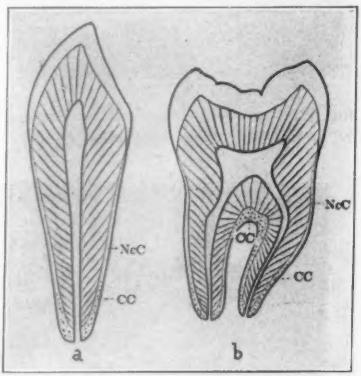

Fig. 6.—Non-cellular and cellular cementum of single-rooted tooth (a) and multi-rooted tooth (b). NcC, non-cellular cementum. CC, cellular cementum. (Churchill.)

all means recognize the fact that diseased teeth and their supporting tissues can and do act as a primary source of systemic infection.

I realize that many of you can cite numerous cases wherein the extraction of teeth has failed to benefit the patient systemically. This I agree has occurred many times, and it will continue as long as teeth are simply evulsed with the hope that all infected tissue will come away with the tooth or teeth. However, when a careful diagnosis is made and an alveolectomy is performed according to the principles laid down by William L.

Fig. 7 (Case 1).—Sensitization reaction from dental infection.

Fig. 8 (Case 2.)—Impaction of lower right third molar, affecting sight of right eye.

Shearer, of Omaha, I assure you that you will be amazed at the amount of infected tissue that can be seen and removed after extraction of the teeth. Success in this operation is contingent upon the thorough elimination of all infection.

The following case histories from my practice will bear out the foregoing statements.

REPORT OF CASES

CASE 1.—E. W. F., a man, aged 42, re-

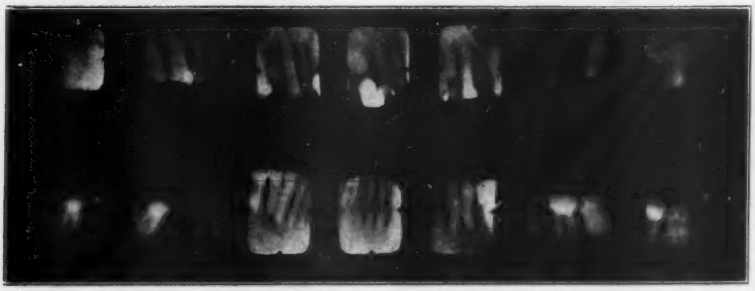

Fig. 9 (Case 3).—Roentgenograms in case of angina pectoris with aneurysm.

Fig. 10 (Case 4).—Roentgenograms in case of myocarditis.

ferred by Otto S. Kretschmer, M. D., complained of a skin eruption on the back of the hands, legs and arms and periodical pain around the heart. He had his own x-ray films. (Fig. 7.) Five molar teeth showed pulp stones. The lower left first molar and upper left second molar were negative to the electric test and the remaining teeth were vital to the electric test. The teeth bearing pulp stones and those negative on test were removed. These teeth were cultured. The upper left second molar showed pure culture staphylococci; the upper right second molar, streptococci in long chains (hemolysis on blood-agar colonies showed streptococci and staphylocci); the upper right first molar, pure culture streptococci, non-hemolytic, in long chains. The patient recovered.

CASE 2.—D. S., a girl aged 18, referred by Simon Miller, M. D., was in the hospital with the chief complaint that she was losing the sight of the right eye. She had sharp pains when she turned her head to the right side. The eye specialist diagnosed the condition as retrobulbar neuritis. The patient was getting shock treatment and her temperature was raised to 102.4° F. Her physician decided that an impacted tooth should be removed as he felt it was inadvisable to take any further chances. In twenty-four hours after removal of the impacted tooth, there was a decided change for the better, and complete recovery followed. (Fig. 8.)

CASE 3.—J. D. B., a man, aged 62, referred by P. J. Conner, M.D., and seen at the hospital, complained of four attacks of angina pectoris, occurring in the past four months. He had an aneurysm behind the sternum. A tuberculous infection had been arrested eighteen years previously. The patient had, as indicated by the roentgenograms (Fig. 9), four teeth bearing pulp stones and two teeth with root canal fillings. The upper central incisors were negative to the electric test. All these questionable teeth and root tips were removed and an alveolectomy was performed. The patient reported that he took a few months' rest and has

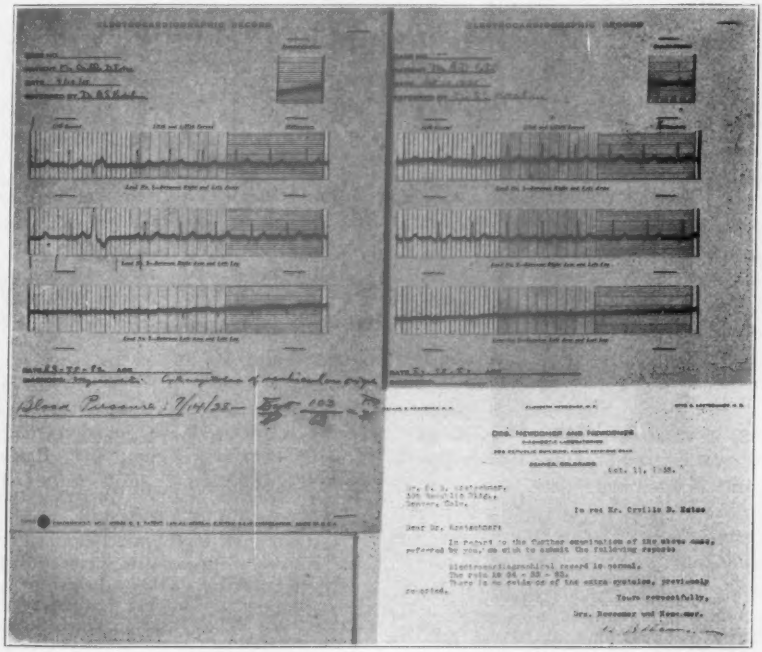

Fig. 11 (Case 4).—Preoperative and postoperative cardiograms.

been working steadily for the past year and a half and is still improving.

CASE 4.—C. D. E., a man, aged 60, referred by Dr. Kretschmer, complained of tiring easily. One week previously, he had a dizzy spell, and was just barely able to get to his chair. He never had fainted and was a large powerful man, a real estate operator, single and financially able to afford the best of care. The roentgenograms (Fig. 10) showed seven devitalized teeth, which had been filled by a root-canal specialist. Two teeth had pulp stones and the lower left third molar was negative to the electric test. From an electrocardiogram, a diagnosis of myocarditis was made and extraction of the teeth advised. This was done and an alveolectomy performed. The teeth were cultured and the devitalized teeth showed diplostreptococci in short chains, non-hemolytic in some cases and partially hemolytic in others. The tooth showing a pulp stone, the upper right first molar, which was vital to the electric test, showed diplostreptococci in short chains, non-hemolytic. This patient is well, as shown by the cardiogram in Figure 11.

Figures 12 and 13, from Price,[8] are self-explanatory.

As dentists, our mission in life is to promote health, and to that end let us be willing to sacrifice all questionable teeth, secure in the knowledge that dental art can restore masticating powers, even though few healthy teeth or no teeth at all remain in the dental arch.

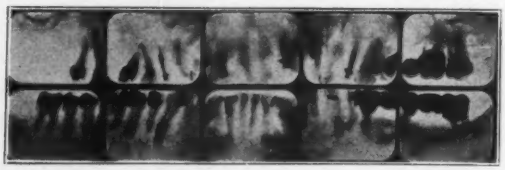

Fig. 12.—Roentgenograms from case referred to in Figure 13. (Price.)

Fig. 13.—Appearance of patient suffering from dental infection (above). The condition resembled a severe hay fever. Toxin from an extracted tooth produced a similar condition in a rabbit (below). (Price.)

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DENTAL CARE IN A NATIONAL HEALTH PROGRAM

By George St. J. Perrott,* Washington, D. C.

IT is a privilege to participate in this the Eighty-First Annual Session of the American Dental Association, and the occasion is made especially pleasant because of the cordial relations which have existed for many years between your membership and the United States Public Health Service, which I represent. The prestige and accomplishments of your organization have gained recognition at home and abroad. No longer, as in the years following the Civil War, are your ranks broken by conflicting sectional loyalties. You meet now as a national association to exchange records of scientific progress in your immediate field and to consider broad problems affecting the nation's health.

The problem before us tonight, the dental health of the American people, is one of tremendous national importance. It concerns not a single patient, but at least 100 million; not a single dentist, but the 62,000 members of your profession. Yet its successful solution involves attitudes and procedures which are essentially similar to those you use as individual dentists, on individual patients.

A patient presents himself for dental care. You make an examination, recommend a plan of treatment and estimate the costs involved. The diagnosis permits no charges of exaggeration of the patient's needs, as the defects are clearly evident to both patient and dentist. Furthermore, the scope of the treatment is adapted to the specific dental disease or defect from which the patient is suffering. The formulation of the plan is thus motivated solely by professional considerations.

One hundred or one hundred thirty million patients present a broadly similar problem. The diagnosis represents the first step in its solution. In general terms, the diagnosis reveals widespread dental disease among these potential patients. A plan of treatment must be outlined, and its costs estimated. Here again, the statement of the magnitude of national dental needs requires no verification. We have heard heated arguments as to whether any one in this country lacks needed medical care, but the disparity between dental needs and the receipt of dental care is so great that it is generally admitted without question.

In the formulation of a program designed to meet these needs on a national basis, there is need for application of the same scientific methods as have made the operative procedures of American dentistry without equal in the civilized world. The American Dental Association, through its several committees, has, over a considerable period of activity, contributed to a better understanding of the scope and extent of this major health problem.

The problems of dental service differ in some ways from those of other health services. In amplification of this point, I should like to present a concise summary which was made by Dr. Harold W. Oppice, chairman of the National Health Program Committee, in his recent statement before the Subcommittee of

Read at the Third General Meeting, Eighty-First Annual Session of the American Dental Association, Milwaukee, Wis., July 20, 1939.

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the Senate Committee on Education and Labor (June 1, 1939), in hearings on the Wagner health bill:

> The peculiar problems presented by dental disease are based on the following facts: (1) the occurrence of dental caries is almost universal; no other disease afflicts such a large part of the population almost constantly with the result that no other profession is confronted with similar problems in prevention and control; (2) dental decay, unlike many other diseases, never heals of itself and always requires the technical intervention of the dentist; (3) dental disease does not ordinarily manifest itself in the striking, unmistakable way that many other diseases do, and thus dental disease is often allowed to go untreated, even when treatment is readily available, until its extent is so great that repeated attacks of pain, an unsightly appearance or systemic involvements demand a service that is more extensive and consequently more costly; therefore, any successful dental program must involve the education of the public to recognize the danger in these insidious attacks of dental disease; (4) the cause of dental decay is not yet scientifically established in spite of intensive research.

The unique characteristics of dental disease introduce extremely complex considerations in the development of plans for its control on a national basis. In considering the details of such a plan, we must break it down into units of manageable size. It may be visualized broadly as presenting two main facets: (1) the amount of dental disease existing at any given moment in the form of accumulated, previously neglected dental need and (2) the volume of dental need which arises each year. Or we may express these concepts in the technical terms commonly used as measures of illness, distinguishing between (1) the *prevalence* of dental disease at a given moment of time without regard to the date of its onset and (2) the *incidence* of dental disease having its onset within an arbitrary period such as a year.

Further subdivision would indicate the need for separate consideration of the problems of children and of adults. Again, we must consider income. There are the totally indigent and the group which may be termed "dentally indigent," self-sustaining in respect to basic essentials, but unable to meet the costs of dental care. Above this income level is the group able to finance its own dental services without assistance of any sort.

Let us consider first the distinction between prevalent and incident dental needs. Since dental disease attacks nearly every individual in the population to a greater or less extent, and since it is generally agreed that less than 25 per cent of the population receive anything approaching adequate dental care, there is apparently an essential basic reason for an accumulated dental need. This is obviously the disparity between the yearly rate of development of dental need and the yearly rate at which this need is being serviced. Recent studies have shown that decay is taking place in the permanent teeth of our school children six times as fast as the teeth are being filled. As a result, the major part of the time of practicing dentists is devoted to a sort of mopping up process; that is, reparative and restorative procedures among adults.

At the moment, we have too few data to permit a final statement of the magnitude of the accumulated need in the average individual. However, its probable aggregate size in the whole population has been estimated by several competent observers and the conclusion reached that there are not enough dentists in the country to care adequately for the accumulated problem. It has also been stated that there is not enough money in the country for the purpose, since costs are estimated variously at from $25 to $85 per capita, or a total of 2.5 to 8.5 billion dollars for 100,000,000 people.

Now although this situation is to be regretted, it does not appear that we should take a defeatist attitude on the

problem. A major portion of the practice of dentistry is made up of procedures concerned with the arrest of the carious process in teeth, removal of the carious débris and the replacement of the previously carious area with chemically stable filling materials. Through long clinical practice, it has been established that this procedure will limit the spread of caries from a small area to other areas in the same tooth. This process in essence conserves the vitality of the tooth, since neglect of the carious process in an area on a tooth results almost inevitably in the death of the tooth, its subsequent infection and recommended extraction. Thus, a good share of the dental disease now prevalent in the population represents the results of earlier neglect of carious lesions. It follows, therefore, that the magnitude of the problem will be greatly reduced when it is limited to care of initial carious lesions which may develop during a given year.

Obviously then, the long range objective of any national dental program must be the servicing of the yearly increment of caries rather than an attempt to meet the problem of dental disease which has accumulated over the lifetime of the population. Eventually, we might progress to a point at which the need was completely cared for each year, and the accumulated problem would cease to exist.

I have discussed this seemingly obvious point at some length because it is often disregarded by estimators of the costs of meeting national dental needs. That is to say, the costs of treatment are frequently estimated on the basis of all dental needs prevalent at the time of examination, representing the total accumulated needs, and the assumption is then made that this will represent the amount of the annually recurring costs.

The fact is overlooked that a systematic plan of dental care will gradually diminish the accumulated need, and the eventual annual costs of replacement of new carious surfaces will be of a very different order of magnitude from the costs at the beginning of the program. Thus, the Technical Committee on Medical Care estimated the minimum cost of adequate dental care as of the order of $7.50 per capita.[1] This figure, of necessity an approximation, is the Committee's best estimate of the annual cost of adequate care of the new yearly increment of dental needs under a plan of group purchase.

Now of course the members of the dental profession know that it is sound economy to visit the dentist frequently. They know from practical experience that the cost of dental care over a man's lifetime will be many times less if he visits his dentist twice a year than if he goes only after years of accumulated neglect.

The comparative magnitude of the dental problem estimated on the basis of *prevalent,* as distinguished from *incident,* dental needs has been expressed in terms of relative time requirements in a recent study of grade school children in Hagerstown, Md., made by dental officers of the United States Public Health Service.[2] The number of carious surfaces in the permanent teeth requiring fillings was determined in a group of more than 4,000 children at each year of age from 6 through 15. On the basis of the observed prevalence rate, the expected incidence of new surfaces requiring fillings in an annual period was computed for children of each age and, finally, for the entire group of surveyed school children. The dental needs thus expressed in terms of prevalent and incident, or new, carious surfaces requiring fillings formed the basis for the following estimates:

About 20 per cent of the professional time of the community's dentists would be needed to care for the *prevalent* carious surfaces requiring fillings in this school population.

Only 10 per cent of the dentists' time would be required for services necessary in

the filling of *new* carious surfaces accruing during a year.

The neglect of the dental problem among children in this community is indicated by the fact that the service represented by the filling of carious surfaces of their permanent teeth actually amounted to less than 2 per cent of the dentists' total professional time.

A dental health program must be developed with reference to the specific requirements of children and adults. Dr. Alfred Walker, in a recent paper, gives an able analysis of the problem from this standpoint.[3] Dr. Walker recommends an organized plan of dental care supported by public funds, combining free and part-pay service, to meet the dental needs of all but those able to pay for adequate care from their own resources, a group he estimates at about 20 per cent of the population. Direction and supervision of the program would be provided by the profession, and participating dentists would be appointed under Civil Service. For adults, the service would include only "minimum dental care compatible with health" (with the exception that adults on a part-pay basis not requiring radical procedures would receive "adequate" care). For children, however, the plan would furnish adequate dental care.

Dr. Walker states:

> An intensive program for children in both groups (i.e., the indigent and part-pay classes) will be productive of the greatest ultimate good and the greatest ultimate economy. The children's program would be based on an extended public health education program; it will utilize part-pay service and indigent service. This service may be given either in dentists' offices or in clinics set up by the Board of Education or Department of Health. The choice of the particular method will be made by the community and by the dentists operating in that community. It may be feasible in some localities where there are no available dental facilities to have travelling dental service units.

A plan outlined by dental officers of the United States Public Health Service for preventing the accumulation of dental defects in the permanent teeth of grade school children is of some interest in connection with the general problem of dental caries in childhood. The dental survey of elementary school children in Hagerstown, Md., made by this group revealed that DMF (decayed, missing or filled) tooth surfaces in the permanent teeth were present in 6-year-old children to the extent of 42.3 per hundred girls, and 34.5 per hundred boys. At age 9, the prevalence rate for girls was 432.5, for boys, 326.5—approximately a tenfold increase for each sex. It is evident, then, that the initial problem of caring for accumulated needs is one of relatively small proportions if approached at the younger ages of childhood. These authors therefore propose a plan providing complete dental treatment for all carious defects in the permanent teeth of each group of new first-grade children, and, in addition, treatment for new increments of caries appearing in the permanent teeth of these children as they pass through successive school grades. Thus, "after the operation of the plan for eight years, all grades of the elementary school population will have received, systematically, treatment for yearly increments of defects."[2] The procedures proposed make only reasonable demands on the professional time of the community's dentists, requiring less than 1 per cent of the total professional time in the first year of operation, and increasing gradually to a maximum of 10 per cent in the eighth year.

The children of elementary school age in this country—6 through 15 years old—numbered 24,402,935 at the census of 1930, and represent about 20 per cent of the total population. A workable plan for meeting the dental needs of this group is thus an important and essential feature of a national program. However, a comprehensive approach to the problem of dental care of children requires special attention to infancy and the pre-

school period, and the assurance of normal development during fetal life through adequate prenatal care of the mother.

A national dental program must necessarily be formulated with reference to the ability of the population to meet its proposed costs. Family income is an important factor in determining the frequency and amount of most medical services. However, the allocation of funds in the family budget for dental care is at present motivated by less compelling reasons than are operative in the case of medical care. As a result, families in the middle income range, for example, may be able to budget the costs of medical care of their average illnesses, but the amount they can, or do, allocate for dental care may fall far short of adequacy. In respect to medical costs, this middle income group is conceived to be self-sustaining. When dental costs are under consideration, it is customary to include families in the middle income range among the indigent, *i.e.*, those who are wholly or partially dependent on outside aid to meet the costs of necessary dental care. I have previously noted Dr. Walker's estimate of the dentally needy as representing about 80 per cent of the population. Let us examine the facts which have contributed to this broad interpretation of dental need.

In 1928-1931, a representative survey was made by the Committee on the Costs of Medical Care under the direction of Dr. Ray Lyman Wilbur, Secretary of the Interior in the Hoover administration.[4] It was found that four in every five persons surveyed had received no dental care during a twelve-month period. This ratio was bettered only among persons in families with an annual income of $3,000 or more. To express it in a different manner: 79 per cent of persons in the middle income range (annual income between $2,000 and $3,000) had received no dental care in the year. In the next lower income class, the figure was 85 per cent, and in the lowest income class, 90 per cent. The point may be illustrated also by the average charges for dental service among the surveyed families. For all families, the average charge per family was approximately $20; but the averages in all income classes below the $3,000 level fell below this amount. In the middle income range, the average was $16, or somewhat over $4 per capita.

The most recent data of this type were obtained in the Consumer Purchases Study in 1935-1936.[5] Families with income between $2,000 and $2,500 (the only group in the middle income range for which data are reported) spent for dental care an annual average of $13 per family in farm counties, about $16 in small cities and about $22 in metropolitan communities. Even in the next higher income class ($3,000-$4,000), the annual average expenditure per family was not in excess of $26 except in the metropolitan centers.

It is evident that expenditures of this order are inadequate to meet even the yearly increment of new dental needs. The considerations which have led both members of the dental profession and medical economists to estimate the population to be served by an organized dental program in terms of about 80 per cent of the population, or approximately 100,000,000 persons, thus appear to be consistent with present performance. There seems some possibility that public dental education in the future may aid in drawing out additional purchasing power which is now latent because of lack of appreciation of the importance of dental care.

However, in considering the over-all costs of any projected dental program, we should remember that it must be a long range program with a modest beginning, building up gradually over a period of years. Furthermore, it would be very naive to imagine that every one in America is eager to jump into a dentist's chair once the economic barrier is

removed. If all dental care were made free tomorrow, it would still be many years before we should see a maximum demand for services.

The uneven distribution of dentists as between urban and rural areas is a factor of some importance in the economics of dental service. At the census of 1930, each dentist in the country served an average of about 1,700 persons, but this ratio varied from an average of 1,290 persons per dentist in an urban state such as New York to 4,000 persons or more per dentist in the rural states of Alabama, Arkansas, Mississippi and North and South Carolina. The disparity observed in recent surveys of urban and rural communities in the receipt of dental care indicates that inaccessibility of dentists in the rural areas is in part responsible for the greater neglect of dental needs by rural families. Among rural and small town families canvassed by the Committee on the Costs of Medical Care, 59 per cent had incurred no charges for dental care during a year. In cities of 100,000 population and over, the percentage was 41. The average annual charge for dental care among rural and small town families was approximately $12; among large-city families, approximately $32.[4] The more recent Consumer Purchases Study, reporting on conditions approximately as of 1935, found that farm families up to the $2,500 income level spent on the average $14 or less per family for dental care in a year, while in metropolitan communities, the expenditure was about $22 or less per family.[5] The disparity appears to be due not to lower professional fees in rural areas for equivalent services, but to actually smaller amounts of service. Thus, in rural areas canvassed by the Committee on the Costs of Medical Care, fillings were placed at a rate of 249 per thousand persons; in cities of 100,000 population and over, the rate was 544 per thousand persons.

In the solution of the dental problem in our rural areas, restoration of balance in the distribution of dentists is an important factor. The economic and professional rewards of dental practice in rural communities must be increased if the extension of dental care in our rural population is not to be impeded by insufficient dental personnel.

Dental health and general physical health are intimately related. Dental defects or loss of teeth have a detrimental effect on digestion and nutrition. Disease of the teeth contributes to the severity of diseases of the heart, kidneys, eyes and other organs of the body. Diseased teeth play an important part in loss of time from school and work and help to swell the ranks of our unemployables.

Because of this close relationship between dental health and general health, we must consider any program for meeting national dental needs in its relation to an integrated national program for the prevention and cure of disease. With this in mind, let me review briefly the objectives of the National Health Program formulated by the Technical Committee on Medical Care.

The execution of the program depends not on the exclusive services of any single professional group, but on the joint effort of general practitioners, medical specialists, dentists, nurses and the wide variety of medical, dental, nursing and other health agency personnel trained in the procedures of disease prevention. Thus, the plan embraces provisions both for the prevention of disease and for its treatment by appropriate professional groups—physicians, dentists, nurses. The plan is, in short, a health program. Its designation as a national health program gives expression to the Technical Committee's belief that problems concerning the health of its citizens are the responsibility of the nation.

While the plan of the national health program was broadly conceived, the Technical Committee made specific recom-

mendations for the execution of its several parts. As transmitted by the President in his message to the House of Representatives in January 1939, these recommendations were four in number.[7]

First, the committee recommended "the expansion and strengthening of existing federal-state cooperative health programs under the Social Security Act through more nearly adequate grants-in-aid to the states, and, through the states, to the localities."

The plan proposed in this recommendation is of special significance because it builds on a foundation already laid in the present Social Security Act. It recognizes the need for the strengthening and extension of the organized services of state and local health departments, both urban and rural, if the full benefits of existing knowledge of disease prevention are to be adequately applied. The specific direction which this expansion would take will depend on local needs. About 1,700 of a total of 3,000 counties in this country are still not served by full-time health service on either a county or a district plan. In these areas, provision of the essential preventive health services—the control of acute communicable diseases, health supervision of mothers and children, sanitary control of water and milk supplies, laboratory service—would represent the first step.

But the modern public health program is constantly expanding. Public health services can no longer be enclosed within static limits embracing five, six or seven essential activities. The control of tuberculosis, syphilis, pneumonia and cancer, activities in oral hygiene, the supervision of the health of the industrial worker, the prevention of mental disease, all have taken their place with the so-called "fundamental" health services. Federal aid would permit development of these new essential services. Only a beginning has been made under the limited appropriations now available through the Social Security Act. In addition to general activities in oral hygiene which would be expanded in connection with this part of the program, important benefits to dental health would result from increased adequacy of care of women in the prenatal period and expanded health and medical services (including dental care) in childhood.

Even the limited federal funds authorized for health purposes under the terms of the present Social Security Act have provided impetus for important developments in dental health activities. Eighteen state departments of health have inaugurated coordinated dental health programs in the three-year period during which federal funds under the Act have been available. At present, a total of thirty-five state health departments are providing such activities, and federal funds budgeted for their support this year amount to approximately $460,000. The programs quite generally are educational in approach, but many make provision also for dental care of children in indigent families. In some states, federal funds have been utilized for postgraduate education of practicing dentists and for research on dental diseases.

The committee's second recommendation provided for grants-in-aid to the states for "the construction, enlargement and modernization of hospitals and related facilities where these are nonexistent or inadequate but are needed, including the construction of health and diagnostic centers in areas, especially rural or sparsely populated, inaccessible to hospitals." The committee also recommended "grants toward operating costs during the first years of such newly developed institutions to assist the states and localities in taking over responsibilities."

The third recommendation of the committee proposed the use of federal grants-in-aid to the states to assist them in developing programs of medical (including dental) care. Recognizing the wide variation among the states in the nature of their health problems and the extent

of their fiscal resources, the committee did not recommend either state medicine (or state dentistry) or health insurance as compulsory national methods of financing a program of medical and dental services. It did not recommend a "federalized system of medical or dental practice." Choice of the financial method of support as well as the population to be served by the program, and its specific scope, were declared by the committee to be problems for solution by the states.

The choice of local methods of support of this part of the program lies between (1) general taxation or special tax assessments and (2) specific insurance contributions from the potential beneficiaries of an insurance system. It may be pointed out that the first method is in general use as a source of support of the activities of state and local health departments, and of hospital care of public charges and the medically indigent in both governmental and non-governmental institutions. In regard to the population to be served, the committee recognized two broad groups: first, the medically "needy" or "indigent," whose individual financial resources are entirely inadequate to meet the costs of medical (and dental) care; second, other families of low or moderate income, ranging up to the $3,000 income level, for whom the costs of treatment would be met more effectively, from the standpoint of both patient and physician, or dentist, by group payment.

At the peak of a gradually expanding program, the committee estimated, on a conservative basis, that about 40,000,000 persons would be potentially eligible for medical and dental relief. About one-half of this number is now dependent on public funds for support; and it is estimated that 20,000,000 additional persons are in self-sustaining families receiving an annual income of less than $800. It is evident that treatment for sickness would not be required by this entire group of 40,000,000 persons during a year. However, the committee estimated that essential medical services, including hospitalization (exclusive of the period of maternity and of care of the tuberculous and mentally diseased), bedside nursing care and emergency dental care could be supplied to the sick in this group at an annual cost of $10 per capita. The Committee's estimate thus included the costs of minimal services. The desirability of upward revision of this figure to provide services for the medically needy on a more adequate level was left to the decision of the states.

In the period since the publication of the Committee's plan, there has been some criticism of the inadequacy of the service which this low average expenditure would provide. The committee itself has recognized this limitation, and has estimated that adequate medical and dental care provided by group payment (through taxation or insurance) would cost not $10, but at least $25 per capita. On the other hand, those who are concerned not with professional standards of adequacy, but with budget balancing, are inclined to consider excessive even a minimal expenditure of $10 per capita.

The committee's fourth recommendation proposed "the development of social insurance to insure partial replacement of wages during temporary or permanent disability."

In formulating these recommendations, the committee was guided by certain fundamental considerations. Foremost among these is the assumption that the health of the nation is an appropriate concern of the federal government. In regard to the scope of the proposed services, it was the Committee's judgment that health is controlled most effectively by a balanced program in which procedures for the prevention of disease are supplemented by treatment of the sick. Finally, the committee believes that the growing interdependence of the states in matters of health and welfare demands increased federal-state cooperation

in the solution of common problems. This conviction finds expression in the committee's proposal that its recommendations be implemented by federal grants-in-aid to the states.

The principle of the federal grant-in-aid is not new. Its first application, more than 150 years ago, took the form of land grants when Congress provided "that a portion of the public domain in what was then the Northwest Territory should be set aside for the maintenance of public schools." In 1837, federal grants amounting to $28,000,000 were made to the states from what has been described as an "embarrassing surplus" in the federal treasury. However, money grants to the states under the system with which we are familiar date from the Hatch Act of 1887, which provided subsidies for the educational activities of the state agricultural experiment stations. In the period of half a century since the passage of this act, federal subsidies have promoted such varied activities as vocational education and rehabilitation, forest fire prevention, highway construction and public employment services.[8]

The Social Security Act of 1935 marks the first comprehensive application of the grant-in-aid system in the welfare field. The act also authorizes limited appropriations for the extension of preventive health services and care of crippled children. The system of federal grants-in-aid to the states for the promotion of health has thus been accepted, and its extension to implement the development of a comprehensive national health program involves only the wider application of a well-established plan.

There are those who view the proposed allocation of federal funds to promote national health as a recently developed form of malignant paternalism. Yet I would call to your attention the report of President Hoover's Research Committee on Social Trends, noting the increased services of government to business, labor and agriculture, developed prior to 1930, "in response to the organized and persistent efforts of these interests, in Congress and elsewhere, and the general recognition of the validity of such a policy of governmental promotion of these important elements. . . . Broadly speaking, industrial and social relations overflowed the banks of the states and swept out over the nation in a flood too great to be controlled by any one state."[9]

The recent economic depression has accentuated these trends, which were discernible earlier. Problems affecting commerce and unemployment have become national problems to be solved on a basis of federal-state cooperation.

But disease also recognizes no state lines. The mobility which is characteristic of our population today is leading inevitably to greater federal responsibility for health protection. State boundaries are patrolled to bar the entrance of diseased plants and fruits potentially infectious to local crops, but the diseased and defective among our population migrate without check, frequently placing the responsibility for their health problems on communities already overburdened. Without federal financial aid and technical assistance, many states are incapable of providing even a minimum level of health protection for their citizens. In this connection, I should like to quote the recent statement of Dr. Thomas Parran, Surgeon General of the United States Public Health Service, to the Subcommittee of the Senate Committee on Education and Labor (June 2, 1939), that "there are more determining reasons for federal assistance to the states in public health than in any other field of social endeavor."

It is significant also that large and representative groups among the consumers of health services are expressing active interest in national health needs. The General Federation of Women's Clubs, the American Federation of Labor,

the Congress of Industrial Organizations and the American Farm Bureau Federation are making increasingly articulate demands for more equitable distribution of the benefits of medical science. It seems probable that the urgency of demands for more adequate dental care will be increased by the effects of the numerous recent programs of dental health education.

Certain principles basic to the method of operation of the federal grants-in-aid in connection with the National Health Program may be noted briefly:

1. The program proposes a system of variable federal financial aid based on the financial resources, special health problems and existing facilities for preventive and curative medical services of the states. This would make possible the development of adequate programs in the relatively poor states. It is assumed that the states in turn will take these factors into consideration in their allocation of funds to local communities.

The states have gained experience with the health aspects of this problem under the system of federal grants-in-aid provided by the present Social Security Act, and, in certain states, additional experience has been derived from the operation of state-aid laws.

2. The federal government should function as a financial and technical agent, but actual administration of the health programs adopted should rest with the states. This procedure has been followed by the Children's Bureau and the Public Health Service under the Social Security Act with complete realization of local autonomy. It was believed that wide latitude should be given to the states in the determination of the methods of providing services and meeting the costs of the program. Nothing in the general program is incompatible with freedom of all practitioners to participate in the plan, and with free choice of physician (or dentist) by the patient.

3. New facilities, such as hospitals, would be constructed only after the need had been established by careful state surveys assisted by expert professional advisory councils. The Committee did not recommend the construction of hospitals where adequate public or voluntary facilities were already available.

4. The use of qualified existing agencies, public and private, in furthering the program is assumed. For example, it was recommended that payment be made for the hospitalization of needy patients in beds of qualified voluntary hospitals.

5. The Committee has recognized that the quality of personnel, services and institutions should be maintained and improved through the setting of minimum standards by the administrative agencies, after conference with professional advisory groups. Increased opportunity for postgraduate education of physicians, dentists, nurses and special personnel in the fields of public health and welfare was felt to be essential. Consultants should be available in the various specialties for aid to the general practitioner.

6. An essential feature of a comprehensive health program is the provision of adequate funds for research into the cause and cure of disease. Any development in the extent of health and medical services must be paralleled by concomitant studies to evolve more effective and economical methods of achieving the objectives of prevention and cure.

The principles and recommendations established by the House of Delegates of the American Dental Association in October 1938 state, in part, that the dental phase of a national health program should embrace dental health education, research, a preventive program and "dental care for those whose economic status will not permit them to provide such service for themselves, to the extent of prenatal care, the detection and correction of dental defects in chil-

dren, and such other services as are necessary to the health and rehabilitation of both children and adults." In connection with the expansion of hospital facilities, it was stated that "due consideration should be given to the inclusion of adequate dental facilities and services." Local autonomy in program planning and the maintenance of a high quality of service and high standards of professional preparation were emphasized.[10]

In fact, as Dr. Lon W. Morrey has stated in a recent paper: "It seems that, in the main, the policies of the American Dental Association are not, nor have they been, very far afield from those expressed in the recommendations of the government's technical committee, with the exception of that part of the recommendation dealing with health insurance."[11] It may be pointed out that agreement extended even to support of the insurance principle, although on a voluntary basis, through budget plans under professional control.

However, it should be emphasized that sooner or later some solution must be found for meeting the dental needs of that great group of self-supporting wage earners and their families who are not at present securing adequate dental care. There is a growing public demand among these families that means be found to meet the dental needs of both children and adults. To many millions of these people, the services of American dentistry are today a museum piece, which they may look at, but cannot touch.

It is obviously futile to carry on extensive campaigns of dental health education among our people, to discover and rediscover dental defects among school children, and then too often provide no means for their correction. In effect, we have been turning them back at the dentist's office with the words "modern dental service is too expensive for the American wage-earner."

In planning for lowering costs of dental service to persons in the lower income groups, we must reckon with the trend toward increased organization of services. In 1932, it is estimated that there were 2,860 clinics which offered dental service and that upwards of 2,000,000 persons received treatment at dental clinics, most of which were located in the larger eastern cities.[12] There seems to be no doubt that the clinic, with its reduced overhead and other economies, can supply dental service at a relatively lower cost. There has been some question about the quality of service at many existing clinics, but the experience of others has shown that dental service of highest quality can be given when administration and professional supervision are adequate.

Practice by groups of dentists offers another possible method of reducing costs. Some professional opinion holds that standards of service are better maintained in this way than in what is ordinarily understood as clinic practice.

This whole complex problem of administration, organization and procedures necessary to get dental service to the masses of our people without sacrifice of quality and at a price they can pay either singly or collectively is one which challenges the best effort of the dental profession. You are the only group competent to judge the value and the meaning of high standards of care. To the consumer who is getting no care at all, it seems an academic question. He feels that any kind of service is an improvement over what he is receiving. His demands are becoming increasingly insistent.

The field of dental research is one of major interest to the federal government for the simple reason that the prevention of caries is a more economical approach than its continual care. This has been the perspective of the Public Health Service in particular for a number of years.

Although I shall make no attempt at this time to survey all the contributions which have been made in attempts to

find the cause of caries, a résumé of investigations being conducted by the United States Public Health Service would include the work on mottled enamel, studies of dental defects in school children, the recent Hagerstown studies and the massive survey of more than a million school children, accomplished through the cooperation of members of the American Dental Association.

In this connection, the Research Commission of the American Dental Association has undertaken an important task. Through the Advisory Committee on Research in Dental Caries, consisting of Dr. Daniel F. Lynch, Mr. Charles F. Kettering and Dr. William F. Gies, there will be available in the near future a summary of present knowledge of the etiology of dental caries. We await the publication of this report with great expectancy, since it may well serve to indicate the direction of new studies in this field.

In an address at your annual meeting two years ago, Dr. Parran made this statement:

> In my opinion, the necessary medical and dental services of this country can be furnished to the people without a federalized system of medical or dental practice. . . . I do not foresee or fear any radical change in the methods of medical or dental practice in this country if our professions recognize the needs of the people for medical and dental care and take the necessary steps to meet those needs.[13]

The serious need of our people for dental care is fully recognized by the profession. The formulation of a plan of treatment is a challenging task presenting problems which can be solved only by cooperative endeavor. As a broad objective, the Technical Committee on Medical Care has proposed the integration of dental treatment in a comprehensive national program of health and medical services. Responsibility for the evolution of plans adapted to local needs rests with the dental profession. The spirit of leadership and impartial, scientific approach to problems of national scope recorded in the history of your Association gives promise that this responsibility will be ably fulfilled.

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SOME TRAGIC RESULTS FOLLOWING EXTRACTION OF TEETH. I.

By Virgil Loeb, M.D., D.D.S., St. Louis, Mo.

EVERY surgical procedure carries with it potential danger from shock, infection, trauma, etc. The extraction of a tooth, however simple, is a surgical procedure, and therefore must be considered as an operation which may result in temporary or permanent disability or even death.

The fact that thousands of teeth are removed daily without any subsequent discomfort may be responsible for the slight attention which this operative procedure and preoperative and postoperative care of the patient receive.

While this paper is in no sense a criticism of the practice of exodontia, it is intended to remind us that perhaps some of the serious results of tooth removal might be avoided if more attention were given to the study of patients.

When one considers the punishment which the oral mucosa receives from the chewing of coarse food, sudden changes in temperatures in eating, traumatism from the toothbrush and the preparation of teeth for inlays, crowns, etc., all in an unsterile field, one realizes that Nature is extremely kind to the mouth, in that the numerous small abrasions and bruises thus caused ordinarily heal without treatment. In spite of the fact that many different types of organisms are found normally in the oral cavity, the percentage of postoperative infection is quite small. These organisms, under ordinary conditions, are harmless, but when the proper field is present, such as a neglected open tooth socket, they may become etiologic factors in the production of disease. Then too, there is always the possibility of infection from organisms introduced at the time of extraction or from other sources before the sockets have entirely healed. It, therefore, seems desirable that extreme care be exercised in the preparation of a patient for the removal of teeth and in the after-treatment.

The preparation for extraction resolves itself into more than a mere study of the local condition. It is quite obvious that one should render the field of operation as nearly sterile as possible, and that he should exercise his best judgment in determining whether a tooth should be removed in the presence of an acute or a chronic infection. Most operators are willing to remove chronically infected teeth in the presence of pus, for in most of these cases the tooth itself acts more or less as a foreign body which Nature is attempting to exfoliate. In the presence of an acute ulcerative process or inflammation, the consensus of opinion is that the acute condition should be relieved, if possible, before the tooth is removed. In addition to consideration of the local condition, attention should be given to the general condition of the patient. Experience has shown that this is perhaps unnecessary with the vast majority of patients who must submit to extraction, but there are those patients, and one never knows just when they may present themselves, whose general

Read at the Twentieth Annual Meeting of the American Society of Oral Surgeons and Exodontists, St. Louis, Mo., October 21, 1938.

condition is such that, were it understood, the method of procedure would be changed materially. It is because of these comparatively few cases in which insufficient knowledge of the systemic condition has resulted seriously that this paper is presented.

Dr. Sale will discuss the history of four or five cases in which unfortunate complications followed the removal of teeth, ordinarily regarded as "simple" extraction. In none of the cases was any attempt made to get a complete history of the physical condition of the patient. In all but one case, the so-called "surgical removal" technic was followed by curettement; and, in the one case, curettement followed simple removal. One of the patients was in excellent physical condition at the time of extraction. In those cases which terminated fatally, it may well be presumed that the procedure employed opened up avenues whereby organisms gained entrance into the blood stream. Perhaps the result might have been the same on removal of the teeth without subsequent surgical intervention, but since the teeth were all chronically affected and were loose, their removal alone might have had less tragic results.

The patient does not as a rule present himself for tooth extraction with the statement that he has some serious organic trouble. If he is referred by his physician, the latter should, of course, convey such information as is necessary to guide the operator in the choice of anesthesia and operative procedure. When such information is not immediately available, and the operator does not exert himself to obtain it, the chance for postoperative complications is greatly enhanced. The question may well be asked, "Should the operator, be he an exodontist or a general practitioner, make a general physical examination before extracting a tooth?" Naturally, this cannot always be done because of lack of training and lack of time, and, as stated previously, this seems unnecessary and is in the vast majority of cases, as shown by the very small percentage of complications following ordinary tooth removal. However, it is the exceptional case which one must always have in mind, and in which he must exercise every possible precaution. Experience develops an intuitive sense which enables one to recognize, in most instances, that the prospective patient is not in good physical condition. When such a person presents himself for extraction, and more particularly if he has reached the age of 50, it is good practice to be sure that at least he has no organic cardiac condition. Patients with cardiac disease must at times be subjected to tooth extraction, but when this is necessary, added precaution is indicated. Just as the surgeon, under certain circumstances, opens an abdomen and drains a gallbladder or an appendiceal abscess quickly and returns the patient to bed because of the danger from more extensive operative procedure, so the exodontist, in certain cases, should remove the condemned tooth and do nothing more, in order to avoid the added possibility of complications. Even if roentgenographic study reveals a pathologic condition about the apical end of a root which, under ordinary conditions, would require curettement, this procedure should not be attempted in patients who are afflicted with certain types of cardiac disease. It is true that we prefer to remove all foci of infection which are etiologic factors in disease, or which might contribute to the progress of disease, but there are cases wherein the condition has been so well-established that the removal of the primary cause may have little effect. It is this type of case which is puzzling, and which requires most careful consideration and consultation between the exodontist and the physician.

Beaumont Building.

SOME TRAGIC RESULTS FOLLOWING EXTRACTION OF TEETH. II.

By LLEWELLYN SALE, M.D., St. Louis, Mo.

THE number of serious sequelae and fatal results of extraction of teeth in this country is relatively small. It constitutes a very small percentage, surely not more than a fraction of 1 per cent, of the total number of extractions.

In the last decade or two, the total number of extractions has increased many times. Formerly, a tooth was extracted because it was the cause of intractable pain or because it was so loose that it was obviously no longer a useful organ. Many teeth which have never caused pain and which are firmly fixed in the jaw are now removed. The many causes for this, I cannot now discuss. I shall call attention to but a few of them: (1) new and safe methods of local and general anesthesia; (2) progress in the art and science of exodontia; (3) new concepts of disease which attribute an important rôle to dental disease in the etiology of many morbid processes, and therapeutic value to removal of infected foci in disease states already present, and (4) improved methods of diagnosis, especially the use of the x-rays.

I have said that the number of deaths following extraction is relatively small. Our aim and purpose must be to make this number approach the vanishing point. I am not concerned here and now with the important matter of determining the indications for extraction. This is a question that is being given constant and thoughtful consideration by members of the dental and medical professions.

I am to discuss a group of cases in which the indication for removal apparently seemed quite clear, but in which removal had tragic results, in two instances being followed by death.

Several years ago, I reported these cases to a small group of medical men. This report was not published and it was thought that it might be of interest to the exodontist.

I should like to call attention to an article by Oppenheim which appeared in the *Berliner Klinische Wochenschrift* of 1910 under the title "Zum Nil Nocere in der Neurologie." The author contends that a physician's first concern must be that he do his patient no harm. In an introductory paragraph, he says:

> All the wonderful advances in medicine of the last few decades carry with them the possible evil that the activity of the physician, instead of a blessing, may turn out to be a blight. Some of the diagnostic methods and therapeutic methods to which many owe improvement and recovery may do harm to others and in exceptional cases may be a real danger.

The physician or surgeon who in desperate situations is afraid to employ heroic measures may at times miss an opportunity to do his patient a life-saving service. The physician who does not balance well the probable gain that may result from his diagnostic measures or his therapeutic activities against the harm that he may do is a dangerous member of the community.

The extraction of teeth has become such a commonplace in this country that it is looked upon by most people as a

Read at the Twentieth Annual Meeting of the American Society of Oral Surgeons and Exodontists, St. Louis, Mo., October 21, 1938.

minor procedure. As has been said, the number of serious accidents following these many operations is comparatively small. In so far, however, as these could have been avoided, they constitute an indictment of the medical and dental professions.

Much progress has been made in exodontia. The removal of teeth today has become a surgical procedure. The method of our forebears, of extracting a tooth and allowing a patient to go home, has been supplanted by the surgical removal of teeth, with postoperative treatment. This change is in part due to the hold that the theory of focal infection has obtained on the medical and dental professions, and the desire on the part of the exodontist to eliminate completely all infection.

It is my purpose to report three cases of serious complications following the removal of teeth. Two of the patients died and one went through a serious illness which almost resulted fatally.

REPORT OF CASES

Case 1.—A man, aged about 30, first seen in 1911, complained of epigastric pain and gave a history that was very suggestive of duodenal ulcer. His past history was of no importance. He had never had tonsillitis, rheumatism, chorea or diphtheria. He was thin, wiry and extremely active. The physical examination was quite negative, as was an x-ray examination of the gastrointestinal tract.

In 1913, the patient, who had not been feeling well for several weeks, developed a very high fever. For a few days, he had vague discomfort, mainly gastric, consisting of bloating and distension. There was evidence of fluid in the left pleural cavity, and, within a few days, the percussion note was dull all over the left side of the back from apex to base. A clear fluid was obtained by aspiration. No record could be found of the kind of cells contained in the fluid. The patient improved very slowly. Fever of a low grade persisted for many weeks and there was a very little gain in weight. The patient was quite weak and could not carry on his work as a factory superintendent. At the time, the primary pleurisy with effusion was interpreted as evidence of a tuberculous infection and the patient was so informed.

In May 1914 the patient went to Colorado Springs. The physician whom he saw there, a man with an excellent reputation, wrote to me that he could find no signs of active tuberculosis, adding that "his effusion I have looked upon as, in all probability, tuberculous in character." After a year in Colorado, the patient returned to St. Louis in good condition and resumed his work. In February 1920, he was operated on for bilateral cataract.

In April 1924, he was examined for life insurance. He told me later that he had been having some trouble with his joints, but, in general, had never felt better in his life. The examiner for the insurance company told him that he had better see his doctor about his heart, which was found to show irregularity due to many extrasystoles. There was a systolic murmur at the apex. An electrocardiogram showed left ventricular extrasystoles. The patient was not seen again until 1928, when he complained of severe precordial pain which had all the characteristics of angina pectoris. He spent three weeks at the hospital. There was no fever, no leukocytosis and no pericardial friction rub. The systolic murmur was now very loud and a cardiogram showed right and left extrasystoles. Later in the year, an auricular fibrillation, at first paroxysmal, and later constant, developed.

The patient remained fairly well for about two years, during which time there was definite limitation of the cardiac reserve. He had been told several years before that there were "pus sacks" about some of his teeth. About July 1, 1930, his dentist advised him to have some of his teeth removed and, under local anesthesia, four teeth were extracted. About a week later, he felt quite weak and found that he had fever. Chills, fever and heavy sweats soon became practically daily features of the disease. The blood culture yielded *Streptococcus viridans.* Painful red swellings of some of the smaller joints, embolic phenomena and enlargement of the spleen followed. Death ensued January 6, 1931.

A partial necropsy was made at the

undertaking establishment. I quote from the protocol:

Petechial eruption. Liver and spleen enlarged. Heart enlarged. The mitral valve is definitely thickened, especially over the right anterior cusp. This thickening can be seen to be due to an old fibrous process upon which is superimposed a ragged fibrinopurulent exudate. The auricular wall is thickened and irregular. Microscopic: On the surface of the valve that is thickened by an increase of connective tissue, numerous small capillaries are found and layers of pus, fibrin, phagocytic cells and numerous clumps of bacteria; in places, there is a tendency towards organization of the exudate as evidenced by fibroblasts, large mononuclears and capillaries. Within the heart muscle itself, there are several small areas in which there is destruction of the cells and replacement with lymphocytes and occasional polymorphonuclears.

In retrospect, I feel quite certain that the pleurisy, which I thought was tuberculous, was due to rheumatic fever.

Case 2.—A white man, aged 72, had been in very good health except for a very mild diabetes which was easily controlled by slight dietary restrictions. He had also had a prostatic hypertrophy which caused symptoms that were very annoying at times and for which he was occasionally treated by a urologist. He had never had any serious infection in his youth and was sure that he had not had tonsillitis, pleurisy, rheumatism or chorea. He had on two occasions had fainting spells. These occurred four or five years before his death, one after vigorous cranking of a stalled automobile, one after running up a flight of stairs. Both times, those about him were frightened, not because of loss of consciousness for a few minutes, but because of his extreme pallor. On each occasion, he was given medical attention within about thirty minutes, by which time he was again feeling and looking quite well. He had not been having any dyspnea or precordial pain before the onset of the present illness, nor was there any cough or edema. For many years, a loud systolic murmur had been audible over the precordium, the maximum intensity being at the apex. The blood-pressure was always within normal limits.

About October 1, 1929, several teeth had been removed under local anesthesia. For several days, there was a marked swelling of the jaw and of the soft tissues in the mouth and considerable pain. There was also slight fever for a few days, but this subsided as the jaw grew smaller. On October 15, the patient did not feel so well and the temperature was found to be 100°F. in the evening. That night, he had a heavy chill and his temperature rose to 103° and was followed by a drenching sweat. From this time on, he frequently had chills, fever and night sweats. On examination, the positive findings were a slight enlargement of the outline of cardiac dulness to the left and downward and a harsh, blowing systolic murmur over the apex. The patient was seen by a urologist who had been taking care of him for many years, and who assured me that no condition in the urinary tract was responsible for the present illness. A number of physicians were consulted and many diagnostic tests of one sort or another were made, none of which threw any light on the diagnosis. The possibility that this might be a bacterial endocarditis was suggested, but this diagnosis did not receive much support.

The picture remained monotonously the same for several months—chills, high fever and sweats at night, normal temperature in the morning. There was a gradual deterioration in physical strength and an increasing pallor. In January 1930, the patient died.

An incomplete necropsy was made at the undertaking establishment. For some reason, the protocol could not be found. The chief finding of interest was a thickening of the mitral valve on which were engrafted lesions, the result of a recent endocarditis. The pathologist who made the examination confirmed this diagnosis.

Case 3.—A man, aged 42, had had pneumonia starting very suddenly November 9, 1936. The patient is able to set the time of onset at 3 o'clock in the afternoon, when he was seized with a sudden pain in the right lower part of the chest at the level of the costal margin. This pain was so severe that it seriously interfered with deep breathing. The patient had no cough and no chill. One hour after the onset, his temperature was 102°, the pulse, 130. Physical examination of the chest was negative except for

limitation of motion on the right side. The pain was very severe. The patient was sent to the hospital and it was necessary to give him morphine to relieve the pain.

November 10, he continued to have pain. He had practically no cough and the physical examination was still quite negative. November 11, an x-ray film of the chest showed an area of increased density in the right upper lobe. The apex itself was quite clear and the density was in the periphery without any evidence of thickening in the hilus region. The density appeared rather triangular in outline. During the next few days, there were physical signs of consolidation in the right upper lobe, consisting at first of distant bronchial breathing and crepitant râles, and later of louder bronchial breathing and indeterminate râles. There was very little cough and little expectoration. November 16, the patient expectorated some bloody material, which was not, however, a blood clot, but apparently bloody mucus. The temperature for ten days ranged between 101 and 104° and then returned to normal. The drop was a clinical one, taking place in about twelve hours. The white cells in the circulating blood numbered from 15,000 to 30,000. During the febrile period, there was a moderate shift to the left. A specimen of the sputum showed that the predominating organism was a type 4 pneumococcus.

During the course of the disease, an atelectasis of the large part of the right lung developed with a shift of the mediastinum to the right. The condition of the patient during the first few days of his illness was such that it seemed questionable whether he would survive.

Two blood cultures were made and no growth was obtained. The patient made a rather slow recovery. He left the hospital December 17, thirty-eight days after admission, feeling about as well as he did before he became sick.

The family history had no bearing on the case. The patient's history is unimportant except that for a few weeks before admission, he had had in the right side of the neck some enlarged lymph nodes, which were at times moderately tender. X-ray examination of the teeth showed some periapical resorption about two molars. At the advice of his dentist, these were removed. The extraction required forty-five minutes. The teeth themselves came out easily and most of the time devoted to the operation was spent in curetting the sockets and "removing infection." Five days after the removal of the teeth, the patient had a sudden pain in the right side and the illness above described ensued. It seems probable that, as a result of the very active manipulation in the infected areas from which the teeth were removed, an embolus lodged in a branch of the pulmonary artery.

I have, on at least two occasions, seen acute bacterial endocarditis develop after surgical removal of teeth. Both of the patients had disease of the mitral valve before removal of the teeth and both died. This is the first time I have seen a pneumonic process which was probably due to the removal of teeth. The practice of curetting, scraping and chiseling after the removal of infected teeth is, I believe, a poor one, and, if consulted in the matter, we should advise against it.

I have reported three cases which illustrate that the principle of *nil nocere* is at times at least violated.

We must be always cognizant of the fact that the removal of infected teeth may be attended by serious complications and even have tragic results. The indications for this operation must be carefully considered from the point of view of the patient as a whole.

After removal of infected teeth, there should be no curetting and scraping, which means much unnecessary trauma and opens up avenues for dissemination of infection. The simple extraction of teeth rather than the modern method of surgical removal is in most instances the operation of choice.

Extreme caution must be exercised, especially in patients in whom there is a preexisting valvular lesion. A damaged endocardium readily furnishes a nidus of infection.

There must be closer cooperation between dentist and physician. Certainly

whenever they are dealing with a person who is not in excellent condition, they should confer as to the indications for removal of teeth, the type of operation and the kind of anesthesia to be used.

In dentistry and exodontia, in all fields of medicine, the guiding principle must be the one clearly enunciated by the great neurologist Oppenheim in 1910—*"Nil nocere"*—"See to it that no harm comes to the patient."

4500 Olive Street.

LOWER IMPRESSION TECHNIC THAT GIVES COMFORTABLE FUNCTIONAL RETENTION IN LOWER DENTURES

By Samuel E. Misner, D.D.S., Miami, Fla.

As an artist first creates a mental picture of that which he is about to paint on canvas, so should the dentist make a mental picture of the denture he is about to construct, having in mind the varying conditions he has to meet, physiologic, anatomic and psychologic. The better he can visualize, the better the denture he will construct.

Therefore, a careful examination of the mouth is necessary as the first step in denture construction.

During the examination, the assistant should make notes of the findings. Anything that might affect the impression taking or the completed dentures should be noted. If the teeth were extracted long before, the tongue may be flattened or broadened considerably and will become a factor in dislodging the lower denture, as well as interfering with speech during the period of adapting itself to the more restricted area when the dentures are worn.

The patient should now be instructed to protrude the tongue and move it from one side to the other. The jaw should be moved forward and to each side. Often, a restricted movement will be noted, especially in those patients who have been wearing ill-fitting dentures for years, many of whom seem to have lost all ability to make these movements.

The relation of the tuberosities of the upper jaw to the ramus of the mandible should now be noted, to prevent difficulty later. The size and shape of the ridges and vault should be checked. The larger the ridges and the higher the vault, the more favorable the conditions for satisfactory dentures, with less liability of leverage during mastication, and vice versa. The muscles around the ridges and not the ridges themselves determine the suction of the denture.

After the examination, the patient should be told of possible difficulty or the degree of success he may expect in wearing the dentures. It is much easier to tell him now, and he will accept the information better now than later, when he begins to experience trouble. In fact, much inconvenience to the patient and the dentist can be avoided by such precaution.

In taking the impressions, the upper is taken first. A tray is selected and trimmed so as not to interfere with the

Read before the National Society of Denture Prosthetists, St. Louis, Mo., October 1938.

various muscle attachments and not to distend the soft tissues. Soft white compound is adapted to the tray and to the approximate size and shape of the ridge. The flame is lightly passed back and forth over the surface to soften it. The compound is tempered in water of about 135° F. Then the tray is gently inserted in the mouth, with little or no force to avoid dislodging the soft tissues excessively. The impression is cooled with water, removed and chilled in ice water. Now, with the tissues relaxed, a soft indelible pencil is used to outline the periphery of the denture. The impression, which has been dried, is inserted in the mouth and held until the outline is transferred to the white compound. The impression is now removed, and the compound trimmed down to this outline.

Now, with a fine torch flame, the impression is muscle-trimmed in the usual manner, until fair suction and stability are obtained. The soft indelible lead pencil is used to outline the relief areas: (1) the anterior palatine foramen, (2) the posterior palatine foramen and (3) the hard areas in the center of the palate, the valve producing area and the posterior border. Again the impression is inserted and held long enough to permit the tracing to be transferred to the white compound. These areas of relief are reduced to a depth of 2 mm., including the crest of the ridge. The posterior border is left extended 3 mm. The inner buccal and labial rims of the impression are lightly flamed, and the impression is tempered in water and inserted in the mouth. It is gently rotated so as to loosen the buccal and labial fit, removed and chilled in ice water. With a sharp knife, the buccal and labial peripheries are reduced from 2 to 3 mm. and beveled the same distance down the inner crest of the rim.

A model is now made of stone and a white vulcanite base is made on it, this base or tray to be used later for the finished impression. The center or crest of the ridge is reinforced with a thickness of vulcanite to give stiffness to the tray. This is now laid aside until the lower base is completed.

A tray is selected for the lower impression, and trimmed so that the buccal and lingual flanges do not impinge on or compress the tissues. White compound is adapted to the tray and shaped to the approximate outline. The surface is warmed evenly with the flame of the hand torch, then tempered in water of 135° F., and gently inserted in the mouth while the patient protrudes the tongue. This impression is not seated firmly, but is chilled in the mouth with cold water, removed and chilled in ice water. This should be an oversized impression. It is dried and laid aside while the outline of the denture is made on the soft tissues. With the mouth open, the patient is instructed to extend the tongue (relaxed) to the lower lip. The tongue is pushed aside gently with a mirror while the mucolingual space is outlined with a soft indelible pencil. The impression is reinserted and held in place until the outline is traced on the compound. With a sharp knife, the compound is trimmed to this outline. The same procedure is followed on the opposite side. Then the buccal and labial folds are outlined and trimmed accordingly.

The compound, having been well trimmed to the outline, is now softened to the depth of from 1 to 2 mm., tempered in water and inserted in the mouth, this time with moderate pressure. The impression is now chilled in the mouth with ice water and removed. It is now placed in ice water for thirty to sixty seconds so that it will be chilled through completely. Thorough muscle-trimming is continued until fair suction is obtained.

There are four important areas of relief needed on the lower impression: (1) the mylohyoid ridge and muscle, (2) the genial tubercle and sublingual glands, (3) the ascending margin of the ramus and (4) the crest of the ridge. The

lingual flange is carefully warmed on the inner surface to a depth of 1 mm., tempered in water and inserted in the mouth. The posterior portion is raised and lowered several times to eliminate any undercut in the mylohyoid region. It is then rotated to enlarge the inner wall of the impression. These movements will tend to relieve the areas of the mylohyoid ridge and muscle and the genial tubercle, or spine, where the genioglossus muscle is attached. The compound is now removed and chilled thoroughly in ice water. These areas are relieved at least 2 mm. more with a sharp knife or scraper in the area of the genial tubercle and sublingual glands. The third area, the ascending margin of the ramus, is relieved by a broad V-shaped notch directly over the edge of the ascending margin. The crest of the ridge is relieved by scraping to a depth of 2 mm.

With the lower as with the upper, the periphery is beveled. This bevel prevents too much compression along the valve producing area. An impression is desired that will reproduce the gentle fold of tissues over the denture and not a stretched condition that will result in cutting and cause trouble. A model is made of stone and a white vulcanite base is made, reinforcing the crest of the ridge.

Bite-rims are now made of black tray compound and attached with dry heat to both upper and lower vulcanite trays. They are built up to the approximate height for the individual case and to the width of normal finished dentures and teeth. The rims are next tried in the mouth, and trimmed down or built up as required until the mouth is open at least 3 mm. too much. Now the occlusal surface is softened slightly to a depth of 2 mm. and the patient is instructed to close, bite and chew until the rims seem to be in the natural rest position. The rims are now removed, chilled and trimmed to a smooth outline. A test for the occlusal height may be made by having the patient sound the letter M. The occlusal surface of the bite rims should be open about 1 mm. on the completion of the M sound. If not, the rims should be built up or lowered until that amount of opening is present.

Now, and not before, are we ready to take a functional impression. There are a number of waxes on the market for this purpose. I use a wax consisting of 1 part beeswax, 1 part white vaseline, 3 parts asiatic wax or paraffin and 3 parts sticky wax. This will have a melting point of about 125° F. The melting point may be raised or lowered by the amount of vaseline and beeswax used. The wax is painted with a camel's-hair brush to a depth of 2 mm. on the inner surface of both upper and lower trays, which are inserted in the mouth, and the patient is allowed to close and bite for about five minutes. The impression is now removed and inspected. At this time, the crests of the ridges are relieved with a spoon or hoe instrument from the cutting set. The impression is now replaced and left for ten minutes while the patient closes, bites, chews and swallows. This step is important as an aid in trimming the lingual flange to the proper contour. The patient should open the mouth wide many times and protrude the tongue as well.

The impression is now removed and the excess wax trimmed away. The impression is then replaced, checked for suction, stability and retention and removed, and more wax is added where needed. The impression is now reinserted and the patient is allowed to continue the same movements, until a smooth, velvet-like impression with retention and stability is obtained. This will usually take from fifteen to thirty minutes.

These impressions are boxed in order to obtain the complete peripheral outline to a depth of from 1 to 3 mm. and a model is poured of stone. Before being separated, they are mounted on a plain line articulator, since the approximate

centric relation is established. The teeth can be arranged on it for trying in. The correct centric position can be obtained at the next visit, according to the dentist's own technic.

After all, impressions are only foundations upon which to build, and unless every step that follows is carried out scientifically, the best of impressions will not solve the problem.

This wax technic may be used in relining dentures. First, we must relieve undercuts and reduce and bevel the peripheral borders, etc. The wax is painted on and, after inspection to determine whether there is sufficient wax, they are placed in the mouth. The patient may wait in the reception room or leave, to return in an hour. When he returns, the denture is usually ready for the laboratory phase.

No originality is assumed for this technic. The ideas were gathered from various writings and clinics. Nor should it be inferred that this is the doorway to the Utopia of lower denture construction: it is not; but it has eliminated many difficulties and has made lower denture construction a pleasure to me.

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SYPHILIS IN RELATION TO DENTISTRY

By Clyde Benjamin Kayne, D.D.S., West New York, N. J.

THE current campaign against syphilis being waged by the United States Board of Health in conjunction with the board of health of each state brings to mind the important rôle that the dentist may play in this campaign; for syphilis often has its first manifestations in the oral cavity. If the dentist is able to recognize syphilitic lesions in the mouth and directs the patient toward early treatment, his efforts are of great value toward its eradication, and also toward both curing the patient and preventing spreading of the disease.

Syphilis, like most diseases, is more amenable to treatment in its earliest stages. Suspicion aroused during oral examination leads one to look for other signs, symptoms or stigmata. In this regard, it is interesting to note that the presence of definite characteristic structural defects pathognomonic of syphilis indicates its existence during intra-uterine life. Observation of these defects will lead to eventual control of this disease in both the mother and the child through therapeusis. This is of special interest, since a syphilitic may give birth to syphilitic children long after her own symptoms have disappeared.

The incisor teeth are affected in such manner as to bear a crescentic notch, produced by repression of the middle mammelon during the process of calcification of these teeth, the two lateral mammelons being unaffected. The incisal edge of the teeth lacking the middle mammelon presents on its anterior surface this notch, which is beveled from in front backward. The teeth are usually shorter than normal and thicker labiolingually, and usually, but not invariably, separated. The surfaces converge from the gingival toward the incisal edge so that this edge has a lesser horizontal diameter mesiodistally than the gingival margin. The mesial and distal surfaces may be straight or rounded. This malformation gives a peglike appearance to the crowns, which are often referred to as peg teeth, or Hutchinson's

teeth. This is of great importance from the standpoint of diagnosis, since the notch may become obliterated owing to wear; whereas the peg shape does not become obliterated and always remains a diagnostic sign.

It has been said, and on good authority, that the deciduous incisors may be similarly affected, becoming notched and peg-shaped. Although not occurring so frequently, similar defects may be demonstrated in the permanent cuspids wherein the enamel of these teeth fail to cover a spicule of dentin, or the enamel itself may be striated. However, when this occurs, it is seldom without other more important diagnostic signs.

The next most frequent diagnostic sign is found in the first permanent molars. At the gingival margin, these teeth are normal, but on the occlusal surfaces, at the base of the cusps, there is a definite erosion; not the erosion of wear, but a disintegration of the occlusal surface itself. The cusps occupy a smaller area on this surface and the vertical and horizontal diameters are much less than normal. A yellow pulpy mass occupies the remainder. These teeth are very friable, easily broken and prone to early decay. When this occurs, they lose their usefulness as aids in diagnosis.

Attention must be called to the fact that the above-mentioned hypoplastic conditions should not be confused with those affections occurring in teeth in early childhood, which result from the faulty metabolism or severe infections of the mother during pregnancy, or from the exanthematous diseases of infancy. These may simulate to some extent, but can be differentiated from, the pathognomonic signs of syphilis.

In a large percentage of cases, there is evidenced faulty development of the alveolar arches and premaxillary bones, contributing to malocclusion. In some of these instances, there is present an elongation of the lower incisor teeth. This may be an effort on the part of Nature to overcome the defects or may be due to a lack of resistance in biting.

Other signs and stigmata of lesser importance are the longitudinal furrowing on the labial surfaces of the anterior teeth, pitting on any surface of all teeth, evidence of delayed eruption and the presence of linear folds of skin radiating from the corners of the mouth, termed rhagades. Whenever possible, as a further aid in diagnosis, it is well to take impressions of the jaws. From these, casts can be reproduced demonstrating the so-called square-angled jaw to corroborate other indications. Here, instead of a well-rounded arch, there is apparent an almost straight line of process from cuspid to cuspid, with a right angle juncture to the process supporting the posterior teeth.

Important though the recognition of congenital syphilis may be, it is far more necessary to cope adequately with the active form of the disease. The situation of lesions of this type is often such as to expose the doctor to infection. The lesions of active syphilis are of three distinct types:

1. The chancre, product of the primary stage, has been frequently reported in the literature as occurring within the mouth proper. When it does occur, its site is on the lips, tongue or tonsil and infrequently on the gingival tissues. The lesion develops very rapidly in contrast to other conditions of these tissues, is very persistent and does not spread. The typical chancre is sharply demarcated, with an eroded or slightly ulcerated surface and a markedly indurated button-like base. It varies from a tiny papule-like lesion to a large crust-covered mass. The predominant characteristic of the primary chancre is the "satellite bubo," the painless swelling of the adjacent lymph glands. The glands are usually hard and fixed and may show unilateral or bilateral involvement. General symptoms accompanying this lesion are mild, usually sore throat, occiptal headache, malaise and possibly fever.

Lesions simulating chancre in the mouth may be produced by irregular or sharp-edged teeth and roots. The latter may, owing to irritation, distort the appearance of a true chancre.

2. The second type of lesion, the mucous patch, appears in the oral cavity during the second stage of syphilis. The typical patch is small, sharply circumscribed, slightly elevated and inflamed and is covered with a gray translucent membrane having a thin red border. Its usual sites are the mucous membranes of the upper and lower lips, the anterior pillars of the tonsils, the inner surface of the cheeks, the soft palate and the tongue. These mucosal lesions are highly infectious and easily communicable.

3. The third type is the gumma, which appears late in the disease and manifests itself as a deep sloughing asymmetrical ulcer, with edges undermined and more or less sharp. It has a slightly indurated base. There is little tendency to bleed and little or no pain, and the breath is fetid. The posterior part of the hard palate at its junction with the velum is the most frequent site of this lesion. The soft palate and maxillary bones are often affected by gumma and, unless it is treated, the extension of this lesion may cause perforation into the maxillary sinus, and the loss or perforation of the nasal septum.

The tongue is frequently involved by gumma or interstitial sclerosing glossitis. In mild cases of glossitis, there are usually several irregularly shaped, depressed or slightly elevated smooth or irregular areas on its dorsum. Upon palpation, there is sensation of induration. In advanced cases, there is more stiffness at the site of involvement; the tongue has a lobulated appearance due to grooves and fissures, and, upon palpation, there is a marked sensation of fibrous induration.

Another lesion which often occurs in this stage is syphilitic leukoplakia, most commonly found on the tongue and lips and about the commissures, appearing as milk-white patches or plaques varying in size and accompanied by glossitis. In later stages, it may become indurated, leathery, fissured and eroded.

No operative procedure of any type should be undertaken once a syphilitic lesion is established, for there is the tendency, in the event of surgical interference, for exacerbation of old inflammatory processes and long and delayed healing may result, often leaving the patient worse off than before. However, after systemic treatment has been inaugurated, and the disease is supposedly eradicated or arrested, any necessary procedure in the mouth may be instituted, teeth being extracted and deformities produced by the disease corrected.

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NECESSITY FOR AND VALUE OF A DEFINITE AND THOROUGH PROCEDURE IN FULL DENTURE TECHNIC

By HERBERT A. MUNNS, D.D.S., Minneapolis, Minn.

IN the *Saturday Evening Post* of March 26, 1938, there appeared a questionable contribution to the nation's health entitled "Dentures," by the well-known magazine writer Samuel G. Blythe.

"Dentures," said he, "is simply a high-sounding monicker for false teeth. Millions wear them. Millions boldly try to eat corn off the cob with them. Millions fail. Millions have to paste them in. Millions are blessed with the long upper lip that conceals them and thus escape looking like a horse. Millions look like horses." And so on in the same vein for several pages.

Edward J. Ryan, editor of *Oral Hygiene,* in a masterful comment on the Blythe article, said, in part,

> Someone could write an informative article for the *Saturday Evening Post* on dentures, and tell the true story. It might read something like this: "Millions of people are edentulous, and even their best friends do not know it, because a dentist has restored teeth and features artistically and naturally. Millions are edentulous and are thus rid of sources of infection that did endanger their lives. Millions of dollars have been spent to make porcelain tooth shades and moulds and denture bases more natural in appearance.

If you read "Blight on Dentures," as Ryan so aptly called it, no doubt you were filled with righteous indignation at the thought of a widely circulated magazine printing such a libelous diatribe against dentistry.

Dr. Ryan said further, "If we are to overcome the fear in the minds of the millions of people who are faced with denture experience, we must make dentures that will *not* destroy appearance, and that *can* be used successfully."[1]

Numerous sound, practical technics have been presented to the profession, but, apparently, too few dentists have the patience to master and execute all the requisite steps. There is too great a tendency to take disastrous shortcuts.

It is my purpose to direct attention to some essential factors in full denture procedure neglect of which causes trouble and difficulty, but which, if accorded the attention their importance warrants, will go a long way toward assuring satisfactory results. I refer to mouth survey, centric relation, accurate mounting of casts, balanced occlusion and esthetics.

Too little attention is being given to mouth examinations in planning full-denture cases. The dentist too frequently extracts the teeth and begins taking impressions without giving the slightest thought to the obstacles to be met or to how he will surmount them. "To determine the possibilities and limitations in a given case, one must give careful consideration to mouth conditions before the work of construction begins."[2] Unless some orderly procedure is followed, important points are certain to be overlooked. At the very least,

Read before the Section on Full Denture Prosthesis at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 27, 1938.

the examination should include the following: (1) x-ray findings; (2) arch size; (3) arch form; (4) ridge form; (5) ridge relations; (6) soft palate classification; (7) lateral throat form; (8) tissue tone and resiliency; (9) border tissues; (10) hard areas, and (11) mounted study models.

Each of these items has a definite bearing on the prognosis and should be made a part of the patient's permanent record, along with such preextraction records as vertical dimensions and tooth form.

Roentgenograms are very important. Whether the patient is edentulous or not, the dentist should at the outset provide himself with a complete set of roentgenograms, both for his own protection and to safeguard the interests of the patient. We have been informed again and again that at least 25 per cent of the edentulous patients going through the Rochester clinic have in their jaws broken-off root-tips, unerupted teeth, cysts or other hidden sources of infection.[3] These foci are a menace to the health of the patient, and, further than that, they are often the cause of discomfort and even failure when dentures are placed over them. Yet how many dentists make a routine practice of securing complete roentgenographic data before proceeding with full denture cases?

RIDGE FORM

It is not unusual to find an upper ridge entirely favorable except for large or bulging tuberosities. We find narrow, knife-edged lower ridges often covered only by a thin layer of mucosa. To attempt to build dentures over such ridges without first surgically preparing the ridges is to court disaster, and to propose surgical measures after the dentures have been made puts the dentist in an uncomfortable defensive position.

Study models mounted on an articulator will furnish one with much more information than the same models held in the hand. Nowhere in the practice of dentistry are they of greater value than in the planning of full dentures.

Not all cases have the same possibilities for success as to comfort, masticating efficiency or esthetics, because of the wide variety of conditions encountered. The patient will be far easier to handle and to satisfy if the dentist has brought about a complete mutual understanding by explaining the obstacles and limitations before they are encountered.

It is necessary to follow a definite outline in examining cases and to plan the procedure before beginning actual work. By so doing, the operator will often be saved the embarrassment of having to alter his course or rebuild the case because of unforeseen difficulties.

CENTRIC RELATION

A frequent source of trouble in full upper and lower denture cases is failure to secure correct registration of centric relation. Centric relation, the most retruded position from which the mandible can make lateral excursions, is also the position to which the mandible returns at the completion of each masticating stroke. When the mandible is in this position, the heads of both condyles are, except in rare instances, in their most retruded position in the glenoid fossae. Unless this retruded relation is achieved in mounting the casts on the articulator, the occlusion of the finished case will be faulty, and faulty occlusion means an unsatisfactory denture case. The appalling number of denture failures that are directly caused by error in recording centric relation makes it imperative that we forsake the old hit-or-miss methods and adopt a technic that will assure a correct bite in every case. To follow a procedure which cannot be definitely checked for accuracy is to invite failure.

With most methods of taking the bite, there is no way of determining whether the jaws are closing in true centric position, for frequently the patient, in his

effort to assist the dentist, closes the jaws in a lateral or a protrusive position. The gothic arch tracing supplies a simple and definite means of recording centric relation and provides a positive method of checking to insure correctness.[4] It requires very little more time than taking the bite in the ordinary way, and the extra time consumed is more than offset by the time saved in subsequent steps, for incorrect relating of casts necessitates remounting and resetting of the teeth. Moreover, if, as often occurs, a discrepancy in the bite is not discovered at the trying in, the completed case will require a great amount of grinding and perhaps reconstruction from the beginning.

In the hands of such men as Drs. Hooper, Needles, Sears, Stansbery and La Due, the use of the gothic arch tracing method for recording centric relation has become a standard procedure; yet many dentists have never attempted to use it in a single case. If we have not, we are overlooking one of the greatest helps in eliminating the difficulties from full denture work.

BALANCED OCCLUSION

From the standpoint of comfort and function, correct setting up of the teeth is a part of full denture construction that deserves a great deal more effort than most dentists are willing to expend. Why is balanced occlusion important? Because, by the very nature of the forces that maintain the dentures on their supporting tissues, it is necessary to avoid counter-forces which tend to displace them. Teeth must be set in such position with relation to the ridges and with relation to each other that when masticating stress is applied, the tendency will be to maintain the stability of the dentures. To accomplish such a set-up is no mean feat, calling for a clear understanding of the whole subject of occlusion.

One often hears the question, "What happens to your balance when there is a bolus of food between the teeth?" Correct correlation of the teeth does not, of course, provide against all displacing stresses during the passage of the cusps through the food, until the teeth come together; but, in the retraction of the jaw from the working bite to centric relation, during which time the chief crushing of the food takes place, teeth that are correctly balanced maintain a sliding contact on both sides which tends to keep the dentures in place. This arrangement of the teeth also helps keep the dentures stable during incision; for, as soon as the incisors have met through the food that is being incised, the posterior teeth come in contact and they remain in contact throughout the retrusive stroke, thus firmly pressing the dentures into place.

In addition to the added stability and masticating efficiency brought about through balancing the occlusal stresses and eliminating cusp interference, there is another extremely important advantage, and that is added comfort due to the minimizing of trauma under the denture bases. Many of the tender spots that develop under dentures are directly related to imperfect distribution of occlusal stresses.

A study of old dentures reveals that, in a large percentage of cases, the bicuspids and molars have been ground until no semblance of normal occlusal form remains. With the cusps flattened and the sulci obliterated, the teeth are not masticators, but mashers.

Why all the grinding? Because the bite was wrong or the set-up was wrong, or both were wrong. I earnestly suggest the expenditure of time and effort necessary to perfect the technic for securing correct bites and balanced occlusion.

ESTHETICS

While comfort and function are prime

requisites, one must not lose sight of the fact that a pleasing appearance is paramount from the patient's viewpoint. Every effort should be made to maintain or restore the natural facial expression and the natural appearance of the teeth. The patient is desirous of looking his best before his fellowmen and anxious to conceal the fact that his teeth are artificial. To accomplish this, the dentist must develop a knowledge of face form and a keen understanding of all factors in the restoration of esthetic values. This is his opportunity to exercise the full extent of his artistic ability and to earn the lasting gratitude of his patient.

If the patient is not entirely edentulous, there will be landmarks of great value in obtaining an esthetic result. Every means should be employed to make a complete record of the color, form and position of the remaining natural teeth, as well as the facial measurements, so that one can correctly establish the relations between the jaws and reproduce the normal contours of the lips and cheeks and the individual arrangement of the teeth.[5] A careful determination of the colors of the anterior teeth before extraction will aid the operator and forestall arguments on that score. A face block cast should be secured by taking a labial modeling compound impression extending from bicuspid to bicuspid with the patient biting in centric position. This will often prove a valuable guide in selecting, grinding and arranging the anterior teeth to reproduce individual characteristics.

Vertical dimension has a great influence on facial expression; hence, it is important that we secure all the data available on this point. This data will aid not only in establishing the correct length of teeth in the new dentures, but also in restoring lost vertical dimension when the dentures have settled after resorption of the ridges. By means of a bite gage, one can easily take the following measurements: distance from base of (1) nasal spine to incisal edge of upper central incisors; (2) chin to incisal edge of lower central incisors; (3) chin to base of nasal spine, and (4) nasal spine to level of crest of eyebrow.

The cases in which few or no preextraction records are available are usually those in which old dentures are worn. The patient would not be coming to us unless changes and improvements were indicated. From the standpoint of esthetics in replacement cases, the dentist's problem is twofold: he must (1) decide what will look best, and (2) gain the patient's approval and cooperation in making the proposed changes.

In these cases, there is usually a considerable loss of vertical dimension, resulting in an alteration of the facial expression. Photographs taken before the loss of the teeth can often be furnished by the patient. These, together with a knowledge of average measurements, will be valuable in determining how far to go in restoring this lost dimension by opening the bite. The best way to gain this knowledge is to measure the natural teeth of a large number of persons. It will be found that the distance from the base of the nose to the incisal edge of the upper central incisors is seldom less than 25 mm.; that from the incisal edge of the lower incisors to the base of the chin, from 40 to 47 mm.; that from the base of the nose to the base of the chin, seldom less than 65 mm., and from that up to 75 mm. or more. The measurement from the base of the chin to the base of the nasal spine usually coincides with the distance from the base of the nose to the level of the crest of the eyebrow.

While I favor the restoration of normal levels wherever possible, the age of the patient must always be taken into consideration. Old people, as a rule, do not readily adapt themselves to such

changes, and with them one must proceed with the utmost caution. When considerable change is indicated, it is safest to make it in two or more successive sets of dentures. Younger patients, on the other hand, will often stand an opening of the bite of from 5 to 10 mm. with very little difficulty.

The selection and set-up of anterior teeth in cases without preextraction records will be greatly simplified if a son or daughter strongly resembling the patient is available for face-block casts. Family characteristics can then be incorporated into the denture with good effect. A collection of selected casts will also prove helpful. Whenever I find a patient with a particularly pleasing arrangement of the anterior teeth, I secure a face-piece impression and file the cast away with the name on the back. Among these, I can usually find one that will harmonize with the face type of the denture patient, and, by copying the details of tooth form, arrangement and wear, secure pleasing results.

To gain the patient's approval of the measures to be adopted often requires a good deal of tact and diplomacy; for often they have preconceived notions entirely at variance with the requirements of the case. Two of the most common misconceptions are that teeth should be small and that they should not show. Visual education is the most effective way to instruct the patient on these points. I have them spend several hours on the street observing the mouths and teeth of young people in conversation, because young people have their own teeth, and by watching them one can tell how natural teeth should look. I also let them study a small album of close-up pictures of movie stars, calling attention to the size of the teeth and how much they show. The pictures and the actual observation of natural teeth will do more to convince these patients than all the talking a dentist can do.

SUMMARY

I quote from Ewell Neil, Nashville, Tennessee, "A complete survey and examination of all mouth conditions leading to a diagnosis and prognosis is an absolute prerequisite to success in full denture work."

Three things should be kept in mind in making mouth examinations in order to obtain the maximum of success in the greatest number of cases:

1. A definite record of the findings in the examination should be kept in a permanent file for future reference and comparative study.

2. A more uniform and standardized method should be followed in making such an examination and keeping the record chart.

3. A study should be made of the findings relative to the oral history, and to anatomic, physiologic, pathologic, physical and mechanical problems presented in each case.

Alfred Gysi brought out the first gothic arch tracer as early as 1914. Although very little attention was given to it at the time, the idea has since proved to be one of the most valuable of his many contributions to the art of denture making. It is to be hoped that the use of some form of gothic arch tracer will be adopted by the profession as the standard method of obtaining centric relation in full denture work.

The subject of occlusion should be given more thought and study. Many dentures that are uncomfortable and lacking in masticating efficiency could be greatly improved by correction of the occlusion.

A careful study of natural teeth as to form, size and arrangement, and their relation to face form and measurements would enable any dentist to produce dentures pleasing in appearance.

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DISCUSSION

Earle S. Smith, D.D.S., Iowa City, Iowa.—I should like to emphasize the value of roentgenograms in the edentulous case. During the past several years, at the infirmary of the College of Dentistry of the State University of Iowa, it has been routine practice to take roentgenograms in all the edentulous cases. At the time of making the last tabulation, roentgenograms had been taken of 385 patients, and these roentgenograms revealed unerupted teeth, broken-off roots, foreign material and cysts in the mouths of eighty-nine of these patients, or 23.11 per cent of the total number of edentulous patients. Although slightly less, it is substantially the same as the Mayo clinic figure quoted. The percentage will vary in different sections of the country, depending on the skill and conscience of the exodontist.

It is somewhat startling to know that when the x-rays are *not* employed for the edentulous cases, it can be expected that one out of four of these patients will carry with him, when he leaves the office with his new dentures, potential trouble in the tissues of his mouth.

In our tabulation of the 385 patients, twenty, or one of every twenty, had unerupted teeth; sixty-one, or one of every six, had broken-off roots; seven, or one in every fifty, had foreign material—pieces of amalgam, broken tips of instruments, gutta-percha, and three, slightly less than 1 per cent, had cysts.

Some may question the importance of these findings. Suits have been lost, in cases wherein a denture was made to rest over an unerupted tooth, because roentgenograms had not been taken. Patients have been made uncomfortable when the unerupted tooth started to emerge through the tissues and found a denture blocking its path. The patient became disgruntled, the dentist came in for criticism and seeds for a lawsuit were sown.

So many feel that as soon as the teeth are extracted, possible sources of infection, as far as the teeth are concerned, have been eradicated. This is far from being true, and the edentulous mouth may be carrying marked areas of infection. Unerupted teeth sometimes have infected areas surrounding them. Broken-off roots are sites of infection. It stands to reason that a broken-off root, having been exposed at the time of extraction to the fluids of the mouth, and also having retained, as it probably did, a fragment of nerve tissue, is a potential source of infection. With dentures causing an intermittent pumping pressure upon these areas, the latter become a greater menace than when lying uncovered and dormant.

An unerupted tooth may be the initial site for the formation of a cyst. While all cysts may not be infected, infected or not they are a source of real trouble.

For their own protection and for the welfare of their patients, it is to be hoped that more dentists will adopt the practice of making roentgenographic surveys of their edentulous cases.

Dr. Munns has emphasized the fact that if displacing forces are to be minimized and if trauma under denture bases is to be counteracted, a balanced occlusion is essential. One wonders just how clear a picture comes to the minds of

different operators when the term "balanced occlusion" is mentioned, judging from the many varieties of occlusion one sees in dentures. To test one's concept, F. M. Hight of Houston, Texas, suggests the unique idea of attaching one end of an orangewood stick several inches long to the labial surface of an upper central incisor by means of sticky wax. If the occlusion is such that when the patient goes through the movements of chewing, little or no movement of the stick extending beyond the lips takes place, the occlusion can be considered as balanced, but it should not be considered so if the orangewood stick moves around.

HEREDITARY OPALESCENT DENTIN
II. GENERAL AND ORAL CLINICAL STUDIES

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THE hereditary nature of opalescent dentin is well illustrated by the case of three unrelated families that came under our observation.[1] In presenting the considerable amount of relevant material that comprises this report, it was necessary to confine the contents of this paper, one of a series, to the clinical findings, both general and oral.

The general clinical examination of the members of two of the families included a physical examination, case history, dietary history, Wassermann and Kahn examinations, blood chemistry determinations, differential blood count, urinalysis and salivary studies. Unfortunately, we were not able to secure information about the third family beyond the fact that the children were healthy and well nourished. Except for the anomaly of the teeth, the physical examinations gave, in general, normal findings. A thorough dietary history reveals that the family have a good, well-balanced diet with adequate amounts of all the food essentials. The M family, because of economic circumstances, have had, within the last few years, a restricted and probably inadequate diet. For example, the younger three children show chest deformities (Harrison's grooves) suggesting rickets in the past. The older children, however, appear well nourished. Since the rachitic deformity and tooth anomaly do not occur concurrently in every case and since the S family had an adequate diet, it is almost certain that the diet has little or nothing to do with the tooth anomaly.

The basal metabolic rate in the various patients varied from +15 to −15, with most of the values normal. (Table 1.) A complete differential blood count on each patient gave normal blood pictures in every case. (Table 2.) The Wassermann and Kahn examinations gave uniformly negative results.

The chemical and microscopic urinalysis of each case gave normal values.

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This work was supported in part by grants from the Rockefeller Foundation and from the Carnegie Corporation of New York.

Presented before the Section on Therapeutics, Pathology and Research at the Seventy-Third Annual Midwinter Meeting of the Chicago Dental Society, February 18, 1937.

1. HODGE, H. C., and FINN, S. B.: Hereditary Opalescent Dentin a Dominant Hereditary Tooth Anomaly in Man. *J. Heredity*, 29:359, September 1938.

(Table 3.) Blood chemistry determinations on each patient gave values for calcium, phosphorus, blood sugar and total cholesterol for the most part within normal limits. (Table 1.) The only consistently abnormal clinical finding was the high values for the plasma phosphatase in the children. These values for the adults are 5 and 7—normal values. The values for the children aged 11 to 16 range from 9.5 to 17.5; for the children aged 3 to 9 years, from 18 to 23.5—values two to five times the normal range. Peculiarly, this held equally true for those possessing as well as for those not possessing the tooth anomaly. Phosphatase determinations on normal child sera made at the same time gave normal values. It is interesting to note that the diseases in which high plasma phosphatase has been reported are the bone destroying diseases such as osteomalacia, rickets, osteitis fibrosis cystica and osteitis deformans or Paget's disease. Of equal interest is the similarity in appearance of opalescent teeth to that found in cases of osteogenesis imperfecta.

Table 1.—Blood Chemistry Determinations*

Patient	Age Years	Phosphatase Mg.	Calcium Mg. Per Cent	Phosphorus Mg. Per Cent	Sugar Mg. Per Cent	Cholesterol Mg. Per Cent	Basal Metabolism†
E.S., Jr.	13	17.5	8.8	4.4	82	210	−15
W.S.	27	6.0	9.96	3.77	74		−13
L.S.	59	7.0	9.3	4.0	92	236	−15
S.S.	11	16.0	11.0	4.1	76	181	0
E.S.	36	5.0					−15
M.S.	2	14.0	10.8	4.9	62		+134 (?)
M.M.	5	18.7	9.5	4.1	78	206	+10
C.M.	16	9.5	9.9	3.8	81	195	+ 1.6
D.M.	9	21.4	9.5	4.4	80	162	
J.M.	4	23.5	9.5	4.1	73	206	+ 2.4
R.M.	2	21.0	9.0	3.5			+52 (?)
V.M.	2	18.0	11.5	4.6			+11
Ca.M.	13	14.6			82	164	

*By A. McCoord.
†Basal metabolic studies by A. McCoord, D. Jamieson and K. Morgareidge.

Careful examination of roentgenograms of the entire skeleton reveals no demonstrable change which could possibly be associated with even a mild form of bone disease. However, the finding of high plasma phosphatase concurrently with hypoplastic dentin may offer some clue as to the degenerative nature of this anomaly. Whether the high plasma phosphatase increase is due to a totally unrelated genetic factor or opalescent dentin is a sequel of high plasma phosphatase remains for further study. There may be some justification for a term such as odontogenesis imperfecta. Since this article was submitted for publication, Roberts and Schour have suggested the term *dentinogenesis imperfecta* as being preferable.

Robert E. Brawley made a complete salivary study, both chemical and bacteriologic, describing his results (Table 4) as essentially "normal" findings.

The clinical oral picture presents varying degrees of involvement. It is therefore not surprising that, on purely clinical information, this anomaly should be reported under many titles. (Finn.[2]) The

2. Finn., S. B.: Hereditary Opalescent Dentin. I. An Analysis of Literature on Hereditary Anomalies of Tooth Color. J.A.D.A. 25:1240, August 1938.

color of the teeth varies from a gray to a bluish brown. However, observed with the source of light behind the teeth, they often show a prismatic display of color suggestive of pink, yet difficult to define. The teeth appear highly translucent; though the dentin is stained a deep brown. The dentin is soft, and therefore the teeth are subject to rapid and excessive attrition. Those teeth erupting first usually show the greatest wear. The dentino-enamel junction is abnormal.

TABLE 2.—DIFFERENTIAL BLOOD COUNTS*

Patient	Red Cells Millions	White Cells Millions	Neutrophils Per Cent	Lymphocytes Per Cent	Monocytes Per Cent	Eosinophils Per Cent	Basophils Per Cent	Hemoglobin Gm./100 Cc.	Red Cell Count (Hematocrit)
E.S., Jr.	5.25	7,600	82	1	19	0	0	13.8	
W.S.	4.82								43.4
L.S.									
S.S.	5.50	5,200	21	62	16	1	0	14.2	
E.S.	6.16	—†						14.4	41.7
M.M.	4.25	6,600	16	81	4	1	0	11.5	
C.M.	5.60	8,800	39	54	5	2	0	12.2	
D.M.	5.10	8,700	76	6	15	2	1	13.5	
J.M.	4.50	7,800	27	61	10	2	0	11.5	
R.M.	5.50	6,400	48	39	10	2	1	12.5	
V.M.	4.90	9,000	61	32	5	1	1	12.0	
Ca.M.	4.65	7,200	72	9	15	4	0	11.2	
M.S.	5.10	7,600	45	30	22	3	0	13.5	

*By D. Culliton.
†Value doubtful.

TABLE 3.—URINALYSIS*

Patient	Reaction	Specific Gravity	Albumin	Sugar	Microscopic Findings
E.S., Jr.					
W.S.	Acid	1.026	0	0	Negative
L.S.	Acid	1.020	Faint trace	0	Occasional hyaline and granular cast
S.S.					
E.S.	Acid	1.016	0	0	Negative
M.S.					
M.M.	Alkaline	1.018	0	0	Epithelium and crystals only
C.M.					
D.M.	Acid	1.020	0	0	Phosphate crystals
J.M.					
R.M.	Acid	1.016	0	0	Epithelial cells only
V.M.	Neutral	1.012	0	0	Cellular débris
Ca.M.					

*By R. C. Robb and M. Gerbasi.

which suggested the term "opalescent." The high degree of translucency appears to be due to the unusual structure of the dentin rather than to any change in the enamel. There is no visible deposition of brown pigment in the enamel, although the dentin is stained a deep brown. The dentin is soft, and therefore the teeth are subject to rapid and excessive attrition. Those teeth erupting first usually show the greatest wear. The dentino-enamel junction is abnormal. Consequently, the enamel has a tendency to crumble off. The severe attrition and crumbling of the teeth often give the appearance of rampant caries. However, there is little or no caries in these mouths. The crowns, though badly worn, are of

TABLE 4.—SALIVARY ANALYSIS*

Patient	Age	Sex	Degree of Caries	Bactericidal Effect (Zones in Mm.) L. Acidophilus R.†	L. Acidophilus A.‡	M. Lysodeikticus R.	M. Lysodeikticus A.	Staphylococcus R.	Staphylococcus A.	Streptococcus R.	Streptococcus A.	Salivary Corpuscles (Per Cm.) R.	Salivary Corpuscles (Per Cm.) A.	Rate of Flow (Per Min.) R.	Rate of Flow (Per Min.) A.	Viscosity (Relative) R.	Viscosity (Relative) A.	PH Quinhydrone (Electrode) R.	PH Quinhydrone (Electrode) A.	Calcium (Mg. per 100 Cc.) R.	Calcium (Mg. per 100 Cc.) A.	Phosphorus (Mg. per 100 Cc.) R.	Phosphorus (Mg. per 100 Cc.) A.
E.S., Jr.	13	♂	56	5.5	4.5	8.0	6.5	3.5	3.0	4.0	3.0	1200	252	0.66	1.50	1.30	1.20	6.69	7.61	5.1	4.9	16.95	17.86
S.S.	11	♀	4	5.0	4.0	8.5	8.0	2.5	Lost	4.0	0.5	756	96	0.40	1.16	1.30	1.10	6.94	7.70	5.3	4.9	14.08	15.87
J.M.	4	♀	29	5.0	3.5	9.0	7.0	1.7	0	0	0	996	276	0.10	0.37	2.50	1.30	6.35	7.61	5.3	5.6	13.70	15.62
M.M.	5	♀	21	4.0	2.0	9.0	7.0	1.5	0	0	0	2544	132	0.25	0.75	1.70	1.20	6.69	7.78	5.8	5.4	12.74	14.49
C.M.	16	♀	14	4.5	4.5	7.0	6.0	3.0	0	0.5	0	1152	252	0.15	0.71	1.60	1.30	6.73	7.70	6.2	6.0	12.66	13.33
D.M.	9	♂	1	5.0	3.5	8.0	7.0	0.5	0	0	0	732	264	0.40	2.00	1.80	1.50	6.60	7.53	6.0	5.7	12.19	13.70
Ca.M.	13	♂	14	5.0	3.5	7.0	5.0	3.0	2.0	0.5	0	576	216	0.40	1.50	1.50	1.15	6.64	7.70	6.5	5.6	11.76	12.66

*Data by R. E. Brawley.
†R, resting.
‡A, activated.

normal dimensions. The roots are short and blunt. This will be readily recognized in the oral roentgenograms. (Compare Fig. 20.) There is also noticeable in these mouths a tendency to formation of apical abscesses. The cervical portion of the roots sometimes shows fracture lines. The pulp chambers and canals are often partially or totally obliterated. The lamina dura appears of average thickness. Vitality tests indicate vital teeth, with a lowered sensitivity to thermal change. The unerupted teeth show normal enamel formation.

A detailed statement of the clinical findings on each family together with their respective pedigrees is appended.

The M family, of Italian descent, was first observed when Dominic applied for treatment at the Rochester Dental Dispensary. Upon examination of his mouth, this unusual condition of all the teeth was noted. Examination of other members of the family proved this condition to be hereditary as their pedigree indicates. (Fig. 1.)

The clinical findings together with typical oral pictures and roentgenograms of the M family are given herewith.

CASE HISTORY OF M FAMILY

C. M., a girl, aged 16, examined November 8, 1935, had a temperature of 37°C.; pulse, 92; respiration, 20; blood pressure, 130/80. Her weight was 60.7 kg., height 156.2 cm. She was somewhat obese and robust looking, and was intelligent and cooperative.

The skin was normal except for acne, slight on the face and chest and more extensive on the back. There was no general glandular enlargement. The head was symmetrical and well-formed. The pupils were equal and reacted to light and in accommodation. The extra-ocular movement was normal. The disk margins were not clear. The hearing was good. There was a rather large tonsillar tag on the left side of the throat. The thyroid was not enlarged. The chest was well formed. The lungs were clear to percussion and auscultation and the bases descended well. The heart was not enlarged. The point of maximal impulse was in the fourth interspace 8 cm. to the left of the midline. The action was regular and forceful, the sounds were of good quality and

there were no murmurs. The development of hair on the extremities was quite marked. The extremities were well developed, without spasticity. There was no clonus and the Babinski reflex was normal.

Oral examination: The mucous membrane was of good color. The teeth were opalescent. Mouth hygiene was excellent. The anterior teeth showed attrition and the central incisors lacked contact with the opposing teeth. (Fig. 2.) The upper right second premolar was worn level with the gum line, probably as a result of fracturing. Roentgenograms revealed periapical involvement of the lower left second molar. The upper right second premolar had an apical abscess. The upper left first and second molars showed severe alveoloclasia. The roots were short and blunt, and there was complete obliteration of the pulp canals.

Impression: 1. Obesity. 2. Myopia. 3. Congenital opalescent teeth. 4. Acne. 5. Elevation of blood pressure probably due to excitement.

Ca. M., a boy, aged 13, was examined September 9, 1935. The temperature was 37.1°C.; pulse, 76; respiration, 22; blood pressure, 100/70. The weight was 45.5 kg.; height, 152.5 cm. (average weight for age and height, 42.3 kg.). The patient was a slender boy, of Italian extraction, and intelligent, alert and cooperative. The skin was normally moist. The hair was abundant, dark brown and not unusually dry or coarse. There was no general glandular enlargement. The glands at the angles of the mandible were moderately enlarged. The pharynx showed a considerable injection and hypertrophy of the lymph follicles. There was a small amount of tonsillar tissue (remnants) on both sides. The thyroid was easily palpable, smooth and homogeneous.

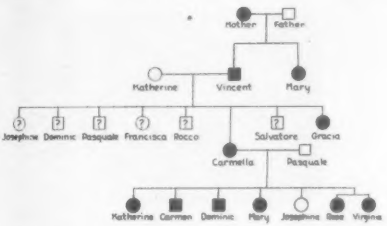

Fig. 1.—Four generations of M family with three matings resulting in 9+ affected (identical twins listed as one individual) and 1+ normal offspring. Six offspring cannot be classified. Since matings of nonaffected with affected produced nonaffected and affected in every case, the factor is heterozygous and dominant. (Finn.)

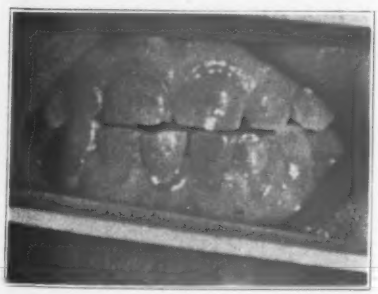

Fig. 2.—Anterior teeth of C. M. The teeth appear opalescent and there is a lack of contact of the anterior teeth resulting from attrition. Careful mouth hygiene is evident.

Fig. 3.—Lower right permanent teeth of Ca. M. The extreme involvement of the first permanent molar is evident.

Fig. 4.—Incisors of D. M. The teeth appear opalescent. Poor home care of the mouth is more evident.

The heart was not enlarged. The point of maximal impulse was in the fourth interspace 38 cm. from the midline. The action was regular and forceful and sounds of good quality, with the pulmonic sound much accentuated. The liver and spleen were not palpable. The genitalia were normal.

Oral examination: The mucous membrane was of good color. The teeth were opalescent and highly translucent. The first permanent molars showed extreme wear. (Fig. 3.) The remaining teeth did not show such severe attrition. The exposed dentin was dark brown.

Impression: Familial defect in development of the teeth.

Fig. 5.—Central incisor showing root fracture across neck.

Fig. 6.—Undeveloped cuspid showing absence of pulp chamber formation. Roberts and Schour are of the opinion that the clinical changes are chiefly a "posteruptive phenomenon," an opinion to which the authors do not subscribe in the face of this evidence. As a secondary factor, however, posteruptive changes must be considered.

D. M., a boy, aged 9, on examination September 9, 1935, had a temperature of 37.3° C.; pulse, 96; respiration, 20; blood pressure, 110/70. His height was 137.5 cm., weight, 31.3 kg. (average weight for age and height, 31.8 kg.). He was a slender, quiet, unintelligent boy of Italian extraction. The hair was dark brown and abundant and not unusually dry or coarse. There was no general glandular enlargement. The pupils reacted to light and in accommodation and the extra-ocular movements were normal. There was abundant thin wax in the ears and hearing was grossly normal. The pharynx was injected, with hypertrophy of the lymphoid follicles. A small amount of tonsillar tissue (remnant) was present on both sides. The thyroid was palpable. The heart was not enlarged. The point of maximal impulse was in the fourth interspace. The genitals were of normal size. The extremities were slender and well formed, with no atrophy or spasticity. There was marked development of hair on the legs and also considerable on the thighs. There was a slight syndactylism of both feet (second and third toes). The toenails appeared to be quite brittle and broke easily.

Oral examination: The mucous membrane was of good color. The teeth presented an

Fig. 7.—Deciduous teeth showing opalescent characteristics. Pulp chambers are absent and canals fine.

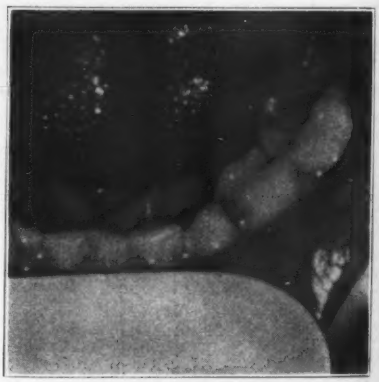

Fig. 8.—Lower left deciduous teeth of J. M. No hereditary involvement is apparent. Prevalence of caries is evident.

opalescent and markedly translucent appearance. The crowns of the upper teeth did not show a high degree of attrition. (Fig. 4.) The molars showed signs of attrition and friability. The roentgenograms were of especial interest. The lower right molar showed radicular and periapical involvement. The lower left molar showed apical abscess. The upper right central incisor showed a fracture line across the cervical portion of the root. (Fig. 5.) The unerupted

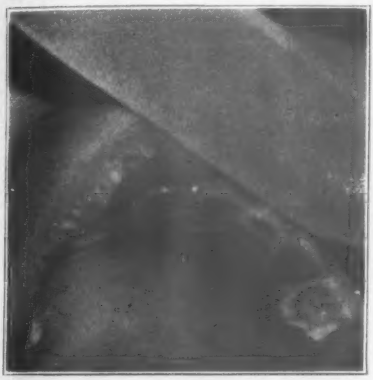

Fig. 9.—Upper deciduous teeth of R. M. There is extreme attrition, especially of the first molar, where the enamel loss shows a horseshoe pattern of dentin.

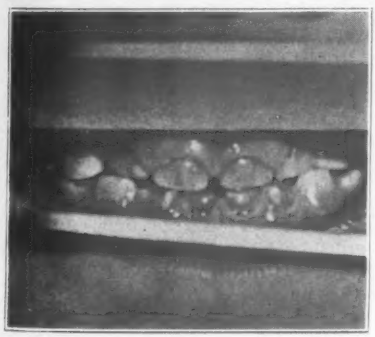

Fig. 10.—Deciduous anterior teeth of V. M. Opalescence and attrition of the teeth are apparent.

teeth showed no pulp chamber formation, this indicating that the change was one of development rather than the later formation of secondary dentin. (Fig. 6.) The root size was decreased in all teeth.

Impression: 1. Familial anomaly of development of teeth. 2. Caries and abscessed tooth. 3. Mental retardation.

M. M., a girl, aged 5, examined November 8, 1935, had a temperature of 37.1° C.; pulse, 92; respiration, 20; blood pressure, 100/65. The weight was 20.6 kg., height, 110 cm. She was of about average development and nutrition, and, although shy, was cooperative. The skin showed many rather small pink scars over the legs, suggesting a pyogenic dermatitis similar to impetigo. About the shoulders and upper part of the back were similar older scars. There was no general glandular enlargement.

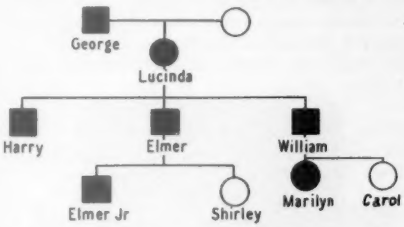

Fig. 11.—Four generations of S family with four matings resulting in six affected and two normal offspring, four male and four female.

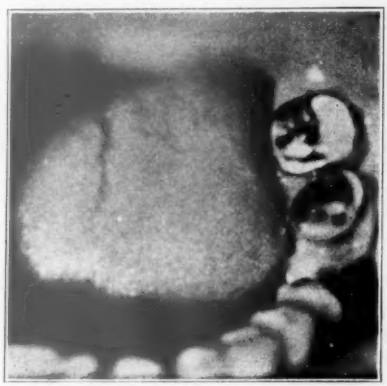

Fig. 12.—Lower left posterior teeth of E. S., Sr. Destruction and attrition of the molars are evident.

The hair was brown and abundant, and not unusually coarse or dry. The nose showed a slight septal deviation to the left. The hearing was grossly normal. The chest was symmetrical, with a slight Harrison's groove.

Oral examination: The mucous membrane was of good color. The teeth were opalescent and highly translucent. The deciduous teeth showed extreme wear, being worn almost to

the gum line. Roentgenograms revealed teeth with small roots and no pulp chambers. The pulp canals were very fine. (Fig. 7.)

Impression: Congenitally opalescent teeth.

J. M., a girl, aged 4, examined November 8, 1935, had a temperature of 36.8° C.; pulse, 104; respiration, 20; blood pressure, 90/60. The weight was 16.5 kg., height, 98.5 cm. She was intelligent and cooperative. There was a heavy growth of fine dark hair over the back, especially about the base of the neck and on the shoulders, diminishing lower down. There was no general glandular enlargement. There was a slight thin nasal discharge. The tonsils were rather large, smooth in outline and considerably injected. The pharynx was reddened. The neck was slender and symmetrical. The

Fig. 13.—Impacted premolar showing absence of pulp chamber and canal.

Fig. 14.—Lower anterior teeth showing fine roots with complete obliteration of pulp canals.

chest showed a fairly prominent Harrison's groove bilaterally. The spleen was not palpable. The genitalia were normal.

Oral examination: The mucous membrane was of good color. The teeth showed no abnormality. (Fig. 8.) There was no evidence of opalescence, but typical caries was present.

Impression: Dental caries.

R. M., a girl, aged 2, the smaller of twins who were very similar in appearance and definitely small for their age (the mother and sister were not small), on examination, had a temperature (rectal) of 37.7° C. Her weight was 12.2 kg.; height, 81.5 cm. The patient was apparently healthy and walked well. She was reasonably cooperative. The skin showed residual tan. The hair over the neck and back was unusually abundant. There was no glandular enlargement. The hair was brown, abundant and normal in appearance. The pharynx was moderately injected. The tonsils were of about average size and much reddened. The chest was well formed except for a marked Harrison's groove bilaterally.

Fig. 15.—Marked attrition of left upper central and lateral incisors, in boy, aged 13. The effects of attrition on the lower incisors are evident.

Fig. 16.—Upper anterior teeth showing extreme friability of crowns and absence of pulp chambers.

Oral examination: The mucous membrane was of good color. The teeth were opalescent and gave evidence of severe attrition, the anterior teeth being worn level with the gum line. The molars showed small islands of enamel on the occlusal surface where attrition had not quite worn it away. (Fig. 9.)

Impression: 1. Familial anomaly of dental development (opalescent teeth). 2. Rachitic deformity of chest. 3. Acute pharyngitis (mild).

V. M., a girl, aged 2, examined November 21, 1935, had a temperature (rectal) of 37.7° C.; pulse, 128; respiration, 40. The weight was 12.6 kg., height, 84 cm. She was larger than her twin, R. M. She walked well. The skin was not remarkable save for the more than average development of hair over the neck and back. The hair on the head was abundant but not otherwise remarkable. There was no general glandular enlargement. The glands in the axillae were barely palpable. The tonsils were moderately enlarged and the pharynx and tonsils showed considerable redness. The chest was well formed except for a definite bilateral Harrison's groove. The abdomen was quite prominent, though soft, and without spasm or tenderness.

Fig. 17.—Normal anterior teeth of S. S., showing translucency of normal as compared with opalescent teeth.

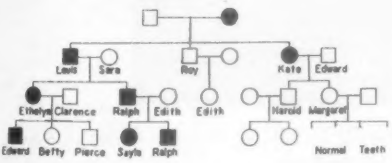

Fig. 18.—Four generations of C family with eight matings resulting in seven affected and twelve normal offspring, seven male and eight female. Mating of normal with normal produced normal offspring in every case. Both male and female affected persons produced affected offspring of both sexes; which shows that the condition is not sex linked. (Finn.)

Oral examination: The mucous membrane was of good color. The teeth were opalescent and highly translucent. The anterior teeth gave evidence of attrition (Fig. 10), although not so marked as in the other twin.

Impression: Familial anomaly of teeth; acute pharyngitis; rachitic deformity of the chest.

CASE HISTORY OF THE S FAMILY

The S family was observed when E. S. applied for treatment at the Rochester Dental Dispensary. The similarity of the teeth of E. to those of the M family was at once apparent. The condition proved to be hereditary in this family also, as the pedigree indicates. (Fig. 11.)

L. S., a woman, aged 59, came in November 22, 1935, for a routine physical examination. She had always considered herself fairly healthy. She had had diphtheria at the age of 7 or 8 and whoopingcough in infancy. Beef, wine and iron had been taken for anemia between the ages of 8 and 14. She had worn glasses for reading and sewing for twelve years. The throat had been sore only the one time in her life. There was no sign of myxedema or hyperthyroidism. There had been bronchial trouble during a winter twelve years previously. The patient had a wheezing in the chest and became short of breath on exertion. There were rather frequent throbbing headaches and dizziness. There had been a slight attack of jaundice twelve years previously.

Fig. 19.—Anterior teeth of S. C. (upper row). The roots are short and blunt and there is attrition of the crowns. Lower row: Nonaffected teeth.

Menstruation began at 14 years, and each period was of four or five days' duration, with a thirty day cycle. The menopause occurred

at the age of 44. Vaginal bleeding occurred once since then, eleven years previously, supposedly caused by the shock occasioned by the sudden death of the patient's husband. The first of four pregnancies was followed by a puerperal infection; the second was accompanied by rather marked swelling of both legs, which the patient thought had been swollen ever since. All of the children were normal at birth. The fourth child died at birth, the cause of death being unknown. The patient married at 20. She had worked as a tailor from the age of 14 to the time of her marriage, after which she worked in a tailor shop for three years. At other times, she kept house for her family. Her mother died at 43, of tuberculosis. A half sister was living and well and had good teeth. Three sons were living and well.

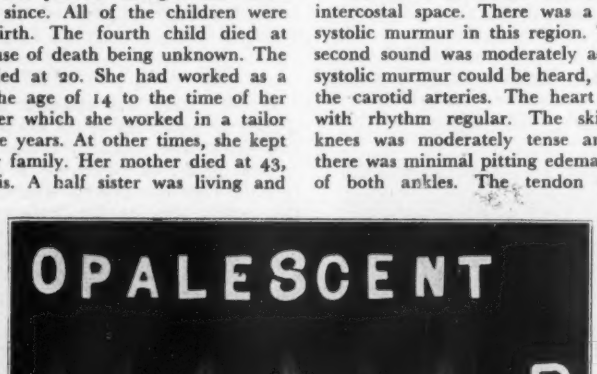

Fig. 20.—Root lengths and loss of structure in coronal portions of dentin of cuspid to cuspid extraction, showing opalescent teeth as compared to normal teeth.

On examination, the temperature was 36.6° C.; pulse, 88; blood pressure, 205/85. The weight was 84.5 kg., height 160.5 cm. The patient was well preserved and moderately obese. She was able to lie flat without discomfort. Her general health was good. The skull showed moderate prominence of the parietal regions. The hair was of normal texture and distribution. The fundi showed normal disks with rather marked tortuosity of the retinal arteries and arterial venous compression. A watch tick could be heard at 9 feet. The thyroid was not palpable. The anterior posterior diameter of the thorax was moderately increased. Owing to thickness of the chest wall, the heart could not be acccurately outlined by percussion. On auscultation, the apex appeared to be about 10 or 11 cm. to the left of the midsternal line in the fifth intercostal space. There was a soft, blowing systolic murmur in this region. The pulmonic second sound was moderately accentuated. A systolic murmur could be heard, transmitted to the carotid arteries. The heart rate was 88, with rhythm regular. The skin below the knees was moderately tense and shiny and there was minimal pitting edema in the region of both ankles. The tendon reflexes were slightly hyperactive, particularly in the upper extremities. The Babinski reflex was normal.

Oral examination: The mucous membrane was of good color. All of the teeth had been extracted except nine lower, which were severely worn and stained a dark brown. Roentgenograms revealed root stubs completely free or only partially embedded in alveolar bone.

Impression: 1. Opalescent teeth. 2. Hypertension. 3. Heart disease, hypertensive. 4. Arteriosclerosis, general.

H. S. had had the upper teeth extracted. The lower were opalescent and showed marked

attrition. Roentgenograms revealed badly broken down right first and second molars and left first molar. These teeth showed periapical involvement and alveoloclasia. The anterior teeth showed some alveolar resorption. The root size was decreased and the pulp canals were totally or partially obliterated.

E. S., aged 36, recalled no childhood diseases except chickenpox, which was uncomplicated. There had been a slight deafness for several years. The neck had been enlarged for ten years. Fullness in the front of the neck was first noted after the sudden death of the father, whose body the son carried from the yard to the house, the physical strain, according to the patient, causing a rupture of something in the neck. He had had one or two colds every winter, but no pneumonia nor pleurisy. He became rather short of breath on exertion, but had had no cardiac pain, orthopnea or edema. He had had frequent sick headache and biliousness as a child. His two children were well.

On examination, the temperature was 37° C.; pulse, 86; blood pressure, 112/70. The weight was 71.6 kg., height, 174 cm. The patient was well nourished and well developed. He proved alert, cooperative and intelligent. The hair was of normal texture and distribution. The hearing was moderately impaired in both ears. A watch tick could be heard at about 3 inches. Air conduction was greater than bone conduction. The uvula was bifid. The tonsils had been removed. The pharynx was moderately injected. The thyroid gland was considerably enlarged and was nodular. The enlargement was greater on the right than on the left and the lower border of the right lobe extended below the clavicle and the sternum. The heart rate was 86.

There was a deformity of the left wrist due to faulty union of a fracture of the lower end of the radius.

Impression: Nodular goiter, nontoxic.

Oral examination: The mucous membrane was of good color. The lower teeth were opalescent and highly translucent. There was attrition of the lower molars and the anterior teeth. (Fig. 12.) Roentgenograms revealed an impacted lower right second premolar. (Fig. 13.) There were nine root tips remaining in the maxilla. The lower anterior teeth and molars showed alveoloclasia.

W. S., a man, aged 27, examined December 11, 1935, had had good general health, the only disease recalled being whoopingcough at the age of 5. Seven years previously, he had had ptomaine poisoning, the illness lasting three days, with no sequelae.

The patient sweated easily and profusely. Sometimes, when working under pressure or hurrying to complete a task, he became weak and faint and perspired profusely. Since graduation from grammar school, he had worked in a sheet metal factory and as a craftsman in the preparation of leaded glass windows. There were no symptoms suggestive of lead poisoning.

On examination, the temperature was 37° C.; pulse, 80; blood pressure, 130/60. The weight was 64 kg., height, 173.5 cm. The patient was well nourished and well developed. He had a rather troublesome non-productive cough. The pharynx was quite markedly injected. The tonsil fossae were red. The left tonsil was small and scarred and the right slightly enlarged and projected toward the middle. The apex of the heart was 8.5 cm. left of the midsternal line in the fifth interspace. There was a very soft systolic murmur in the mitral area. The rate was 80. There was bronchial vesicular breathing over the right upper anterior region of the chest. The skin of the hands and feet felt cold and clammy, and during the examination there was rather profuse sweating in the axillae.

Oral examination: The mucous membrane was of good color. The lower right first molar had been extracted. All third molars were absent. The teeth were opalescent and highly translucent. There was only slight attrition, with rather definite fracturing of the posterior teeth. Roentgenograms revealed an apical abscess about the roots of the lower left first molar. The root size was decreased and the pulp chambers were absent. (Fig. 14.)

Impression: Opalescent teeth.

E. S., Jr., a boy, aged 13, was examined June 8, 1935. The temperature was 37.5° C.; pulse, 96; respiration, 22; blood pressure, 135/75. The height was 152.5 cm., weight, 52.3 kg. (average weight for height and age, 42.3 kg.). The patient, who was somewhat obese, was intelligent (in the eighth grade) and cooperative. The skin was well tanned. The distribution of fat was particularly noticeable on the breast and hips. There were many small old white striae about the hips. The legs were quite large. The presence of a definite valgus (knock knee) suggested a pituitary type of obesity. The mons pubis was prominent. The hair was abundant and dry, but not unusually coarse. The vision was apparently good. The fundi were normal except that the nerve heads appeared unusually pink. The facial appearance was somewhat that of an edentulous person, owing to wearing down of the teeth. The tonsils were very large and moderately injected. The thyroid was just palpable, soft, smooth and uniform in consistency. The genitalia were markedly underdeveloped, the phallus being only about 3 cm. long and testes about the size of those of

a 7 or 8 year old boy. There was no pubic hair. The left inguinal ring was slightly dilated. The nails on the big toes were split. The patient bit his fingernails.

The chest showed slightly prominent lung markings in the lower lung fields, but no areas of consolidation. The costophrenic angles were clear. There was apparently slight calcification in the region of each hilum. The findings suggest tuberculous infection, but there is no evidence of the disease.

Oral examination: The mucous membrane was of good color. The teeth were opalescent and markedly translucent. They presented, rather than evenly distributed attrition, a selective destruction of certain teeth more than others. (Fig. 15.) There was an extreme Class 3 occlusion, possibly accounting for the uneven attrition and fracturing. The molars presented an appearance suggestive of caries and yet not the typical appearance of a carious lesion. The roentgenograms showed the decreased root size of all the teeth. The lower right first molar showed an apical abscess. The upper left first premolar showed apical resorption. The pulp chambers were obliterated; the pulp canals partially obliterated. (Fig. 16.)

Impression: 1. Congenital defect of the teeth. 2. Obesity (pituitary origin?). 3. Basal metabolic rate probably low.

S. S., a girl, aged 11, examined October 30, 1935, had a temperature of 37° C.; pulse, 104; blood pressure, 120/80. Her weight was 34 kg., average for her height, 141.5 cm. She was apparently a normal, healthy, intelligent girl (in sixth grade). There was no general glandular enlargement. The tonsils had been cleanly removed. Other findings were negative.

Oral examination: The mucous membrane was of good color. The teeth did not show anomaly and were otherwise in good condition. (Fig. 17.) Mouth hygiene was excellent.

Impression: Normal health.

M. S., daughter of W. S., born March 6, 1933, was examined September 30, 1935. The temperature (rectal) was 37.5° C.; pulse, 120. The height was 92 cm., weight, 11.6 kg.; head, 49.5 cm., chest 48.5 cm. There was no general glandular enlargement. The hair was fairly abundant, fine and soft. The tonsils were large and moderately injected. The chest showed a marked Harrison's groove bilaterally. Over the great vessels of the neck and right subclavian artery, there was a systolic murmur the cause of which was not evident.

Oral examination: The mucous membrane was of good color. There was complete wearing away of the crowns of all erupted teeth. The rooth appeared opalescent and highly translucent. There was no evidence of caries. The patient has since died of a double maxillary sinus infection.

Impression: Familial abnormality of the teeth.

CASE HISTORY OF THE C FAMILY

The pedigree of the C family, along with the extracted teeth of S., were submitted to us for study by Edith C. Leonard, of Scotia, N. Y. Figure 18 gives the pedigree and other information regarding the family. S. C., a girl, aged 18, had teeth that were characteristically opalescent. The roots were short and blunt. (Fig. 19.) Attrition was marked. The root canals were obliterated at the cervical end. (Fig. 20.)

SUMMARY

Hereditary opalescent dentin can be identified clinically by the amber color, increased translucency, tendency to fracture and wearing away of the teeth. Roentgenograms show decreased root size, absence of pulp chambers, and total or partial absence of canals. The teeth have a lowered sensitivity to thermal changes. The abnormality is inherited as a dominant characteristic.

The authors acknowledge the assistance of the following persons: H. B. G. Robinson, who referred the C. family; A. McCoord, D. Jamieson and K. Morgareidge, who made the basal metabolic rate studies; A. McCoord, blood chemistry determinations; D. Culliton, blood counts; R. C. Robb and M. Gerbasi, urinalyses; R. E. Brawley, saliva analyses; R. C. Robb and Curt Stern, consultations on genetics; and H. Henn and W. Schusterbauer, photography.

THE DRY SOCKET: COMPLICATIONS AND TREATMENT

By Leo J. O'Hearn, D.D.S., Pittsfield, Mass.

IN PRESENTING the subject of dry socket, I direct my remarks to the general practitioner for the purpose of provoking discussion to ultimately benefit those who have suffered the experience of so-called dry socket and its complications, and to offer aid to dentists who daily are attempting to relieve their patients of this very painful postoperative condition.

Mead states:

Dry socket is usually caused by infection and inflammation of the bone around a root, or is due to a long standing chronic infection whereby the bone has become infected. When the tooth is removed and the tissue traumatized, an inflammation is set up that resembles an osteomyelitis of the bone proper, but is limited in this case to the tooth socket.

We know that traumatism of the tissue involved in the removal of teeth results in cell deterioration. Where trauma is excessive, there is considerable soreness of the part, and sloughing of the hard and soft tissues followed by almost constant pain during a period of a week or ten days.

The bone structure of the jaws is subjected to considerable pressure in the removal of a number of teeth. It appears that in some of the cases in which excessive pressure is applied by the use of burs, chisels or other means, the inevitable result is the so-called dry socket.

Kronfeld writes:

Bone has only one way of responding to pressure, namely, by resorption and by compensatory new formation, regardless of whether the pressure upon the bone is caused by an erupting tooth, by a slow growing cyst or tumor, or by orthodontic force. All these factors cause a compression of the periosteum overlying the bone, with the resulting appearance of osteoclasts and the elimination of bone, which eventually tends to relieve the compressed soft tissue and to restore the disturbed tissue equilibrium.

It follows that during the process of bone resorption in dry socket cases, there is no equal activity of the granular corpuscles, osteoblasts and bone-destroying osteoclasts. In this case, it would be evident that as healing of the peripheral edges of the buccal and lingual plates of process progresses, an unevenness of bone formation develops.

We must now consider the fact that the soft tissues surrounding the orifice of the wound, especially the buccal mucosa, rest and heal upon the serrated bone surfaces. The constant healing and contraction of the soft tissues surrounding the sockets set up inflammation resulting in hyperemia and edema of the tissues.

Many authorities are of the opinion that the severe pain accompanying this condition is directly caused by dehydration of the bone of the deep socket. With this conclusion, I do not agree. Having observed hundreds of cases, I am convinced that the primary cause is specifically irregular resorption of the buccal and lingual plates of bone, contacting the already inflamed soft tissue areas.

Every dentist who practices exodontia realizes that this type of patient presents one of the most difficult problems for solution. Every practitioner has a remedy, to effect a cure or bring relief to the sufferer.

Although it is customary to insert a medicated gauze dressing in the so-called dry socket, this procedure does not give the patient much relief regardless of the drug or combination of drugs employed.

My experience with cases of this kind has proved to me that the mucosa adhering to the sharp edges of the bone is the principal factor in postoperative pain.

Administration of nitrous oxide or the injection of procaine should be carried out and the sharp edges surrounding the socket should be made as smooth as possible. The soft tissues should then be sutured. The deep socket may be cared for in the usual manner with a medicated dressing. It is imperative at this point to relieve the irritation which results from adherence of the mucosa to the bone by separating the soft and hard tissues and inserting iodoform gauze along the alveolar ridge to protect the tissue for a few days. Anodynes should be administered, immediate relief thus being assured.

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184 North Street.

A SATISFACTORY METHOD OF MAKING AND FILING IMPRESSIONS OF THE ANTERIOR TEETH FOR RECORDS

By ROBERT N. HARPER, D.D.S., Danville, Va.

FAILURES in artificial dentures are often caused by a wrong estimate of the value of even a so-called minor step in the technic.

The dentist who accepted the set-up shown in Figure 1A would never have done so had he recognized the value of preextraction records. The patient will have to suffer the loss of personality and efficiency, and endure speech impediment, as long as he wears these dentures.

The denture shown in Figure 1B, made from preextraction records of the case shown in Figure 1A, portrays the type of occlusion, size and form of tooth that should have been used in the artificial replacement.

Figure 2A shows the artificial tooth arrangement used for a case with a natural overjet of 8 mm. The patient rebelled against the loss of personality, efficiency, etc., and sought relief elsewhere. The loss of this patient could have been prevented had impressions been made prior to extraction, and rightly interpreted.

Figure 2B illustrates the arrangement used for a successful completion of this case.

Teeth that are selected by guess and arranged in a preconceived and stereotyped manner are no longer tolerated. Patients desire dentures that are individual, and the assured way to accomplish this is to have "blue prints." The only blue prints worth while are impressions of the patient's natural teeth.

Very seldom do we find a patient who really knows how his natural teeth look, or looked in centric relation. Patient and dentist have a different idea, in retrospect, as to the arrangement of the teeth,

the horizontal distance between the upper and lower teeth (the overjet), the width, length, etc., of the anterior teeth. When a patient says, "I did not have a wide tooth," "My teeth were short" or "My teeth were long," it is of little help to the prosthetist in building natural-looking dentures, but a record model is a great help.

We also need blue prints for protection against those patients whose mental attitude is unfavorable toward denture service—the fault finders—to demonstrate that the teeth were set in this manner because it was the only natural

A B

Fig. 1.—A, record model of complete denture failure. B, record model showing size and form of tooth and type of relationship that should have been used in denture A.

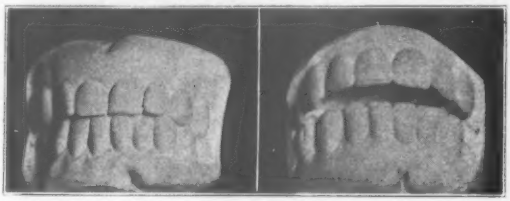
characteristic arrangement, the model being the proof.

We are more fortunate than others who build, because they are forced to conceive their blue prints; we already have ours. Why, then, do we continue to destroy these valuable guides and thus be forced to guess how the case should be built? The guess usually results in dentures suggesting that every case had been made from the same mold. No wonder the patient dreads the thought of dentures, when he sees friends wearing glaring examples of our interpretation of their original teeth.

To copy the characteristic arrangement of the natural lower teeth shown in the record model, Figure 3A, will certainly have more pleasing esthetic results than to copy the overused stereotyped lapping. Figure 3B shows the reproduction in the lower denture.

Figure 4A shows a "bite-opening case" in centric occlusion. Figure 4B shows the position of the natural teeth, with the bite opened the desired amount. No words could tell so clear a story as is told by these models.

In an earlier article,* I made a plea for the use of preextraction records, but did not describe a satisfactory method, because there was none at that time. The large majority of general practitioners are failing to obtain the many advantages offered by a systematic use of impressions of the natural teeth for denture records because of this lack of a



A B

Fig. 2.—A, another complete denture failure, mechanically and esthetically, due to use of stereotyped tooth arrangement. Successful dentures for the same case are shown in record model B. The amount of overjet is to be noted.

satisfactory method of procedure. The faults of the old methods have overshadowed their value and as a whole they have been ignored.

Figure 5 shows the old type records mounted on a wire articulator. What are some of the faults of the ordinary impression methods for taking records?

*HARPER, R. N.: Analysis of General Practitioner's Complete Denture Service. J.A.D.A., 26:244, February 1939.

1. The ordinary separate (upper and lower) impressions taken in wax or compound are not satisfactory because:

a. In order to articulate, the posterior teeth must be in opposition.

b. When no posterior teeth are present, an articulator of some kind must be used.

c. A bite is necessary.

d. They do not show clear outlines of the labial surfaces of the anterior teeth.

e. The bulk prevents a satisfactory system of filing, thus discouraging the making of records, which should be made some time before denture service will be required.

f. The use of two trays, two impressions, two pourings, two trimmings, etc., is required.

2. Accurate impression materials, such as the colloids, require far too much time and expense and also have the disadvantages given in a, b, c, e and f.

3. The use of compound held in position by the lips to obtain impressions of the labial surfaces of the teeth fails to be of any value for any type of occlusion, save the end-to-end bite; and even then, distortions are nearly always obtained and clear outlines of the teeth are not possible.

4. Only in certain types of occlusion can a satisfactory labial surface impression be obtained with the use of a single curved piece of metal.

The ideal record should:

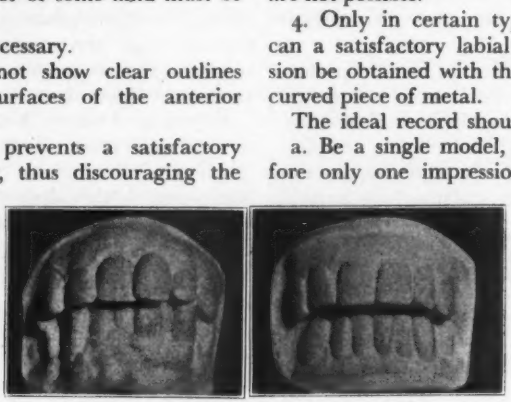
a. Be a single model, requiring therefore only one impression, one pouring, one trimming and no mounting.

b. Be of such a size that a number of models can be filed in a small space.

c. Show clear outlines of the labial surfaces with no distortions.

d. Show the amount of overjet and overbite.

e. In the retrusive cases, show the full length of the lower anterior teeth, as well as part of the lingual surface of the upper teeth.



A B

Fig. 3.—A, record model of natural teeth showing characteristic arrangement. When it is used as a pattern, the results are pleasing. Such results were obtained in the lower denture shown in B.

A B

Fig. 4.—A, case in centric relation. B, case with bite opened. Preextraction records are of unusual value in "bite-opening cases." This new method of making record models requires so little time and effort that all operators can afford the advantages offered in making two records in such cases.

All of the procedure outlined should take the minimum amount of time and expense, with no discomfort to the patient, and should require only one tray for all types of occlusion.

Such a record can be obtained with the Harper's adjustable labial surface impression tray shown in Figure 6.

Cases with an overjet of about 1 mm. will show part of the lingual surfaces of the upper teeth. As these models are very small, very little room is required for filing, a large number occupying the space required for one record made in the old manner. This encourages us to make record models for many more cases and at a much earlier stage of mouth changes.

The name of the patient, date of the record and shade of the teeth are printed on the model, and when we are ready to begin construction, even ten years from the date of the record, we will not have to depend on guessing how the case should be built, as we have a record of the form of tooth; ovoid, tapering or square, and the length, width and shade of the teeth. Thus we are assured of selecting artificial teeth that will harmonize with the facial characteristics.

The amount of overbite and overjet are also recorded, designating the jaw relationship, from which is determined the correct arrangement of the artificial teeth.

We also have a picture of the characteristic arrangement of the natural teeth, with clear outlines, which, when incorporated in the dentures, gives pleasing re-

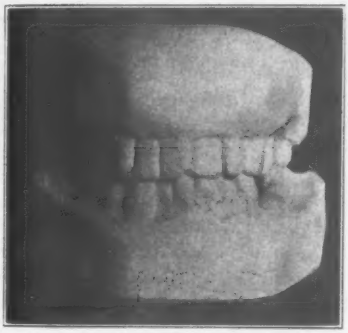
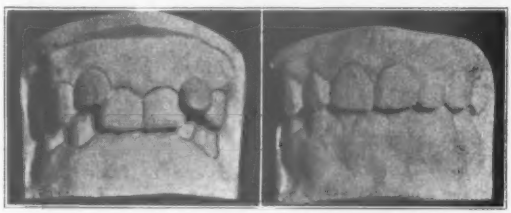


Fig. 5.—Old type of records that are costly in time and filing space. The failure to obtain clear outlines of the labial surfaces as is obtained in Figure 4 is evident.

Fig. 6.—Tray used in making single record models in centric relation, composed of two sections and adjustable to all types of occlusion.



A B

Fig. 7.—Models before treatment (A) and after treatment (B). The improvement in this case of orthodontia is plainly shown in these two small record models. (Courtesy H. T. Gosney, Danville, Va.)

sults; all of which are obtained in a few minutes, with no discomfort to the patient.

If the dentist has been in the habit of taking impressions prior to extraction, he realizes their value, in spite of the faults which are eliminated by the use of this tray. Patients return even from far away when in need of dentures, because they remember the record made before their teeth drifted out of line, and they believe we are prepared to arrange artificial teeth in a manner which will assure a pleasing appearance. And appearances are a dominating factor in prosthodontia, so much so, in fact, that our chances for success diminish in proportion to our disregard of this factor, no matter how much consideration is given to other factors.

Fig. 8.—Model showing labial surface cavities. The model is prepared according to the indirect inlay method.

On the other hand, if we have never realized the value of impressions for records, we find, after giving this method a trial, that results improve mechanically and esthetically, and we will have fewer complaints. This statement will prove true whether we use a scientific or an unscientific technic and whether or not we depend on the commercial laboratory for the set-up. A record model can be sent to the laboratory and any good technician needs no other instructions.

The use of this tray is not confined to prosthodontia. Figure 7A shows a record model of an orthodontia case before treatment. Figure 7B shows the same case after treatment. As 95 per cent of patients who seek the service of an orthodontist do so to improve their appearance and as improvement is measured by the anterior teeth, would it not be wise for orthodontists to present to the patient, on completion of the case, models of the anterior teeth before and after treatment? The orthodontist can conserve time, expense and filing space, and also obtain a much clearer model of the anterior teeth, in a large percentage of his cases, by using this tray.

Accurate impressions can also be made of labial cavities for porcelain or gold inlays. One or more cavities can be prepared at one sitting and impressions be taken which will assure an accurate copy of the cavities for the technician. The case shown in Figure 8 was successfully handled in this manner.

A model made by this method would also be of great assistance to the technician in making porcelain jacket crowns. The clearness of outline of the teeth, as well as the bite arrangement, would afford a perspective of value in planning and during the construction.

The value of identification by the teeth has long been recognized, but the handling of identification cases has never been systematized. Record models lend themselves to a systematic filing and, in time, will make the dental profession a very helpful ally of those seeking assistance in identification.

The procedure used in obtaining the impressions from which these models of varied use are made is simple and inexpensive and requires only a few minutes. Because the tray is adjustable, only one is necessary for both upper and lower teeth in all cases.

It does not matter what technic is used or what the size of the fee received for denture service, we can now all afford the advantages offered by preextraction records, and our results will improve in proportion to the value we place on these records.

Masonic Temple Building.

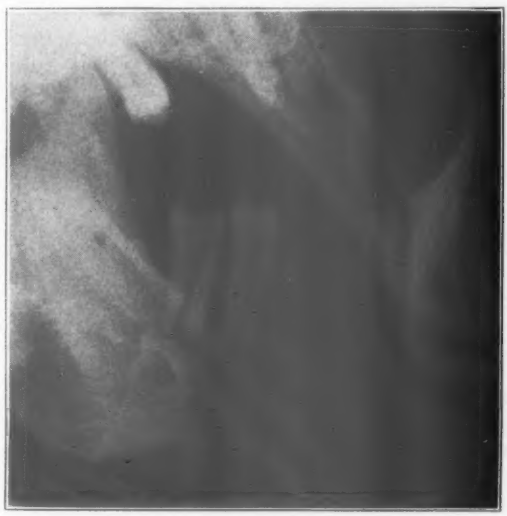
SUBMAXILLARY CALCULUS

By Zachary Eldridge, D.D.S., New York City

History.—A man, aged 23, had for several weeks noticed a "swelling" of the right jaw which became larger and was particularly annoying after eating, but subsided about one hour later. He had considerable discomfort directly after a meal, but he was annoyed more with the enlargement of the floor of his mouth than with the pain. He had had considerable pain with the swelling the previous week and feared that he might have "cancer." He had noticed a peculiar taste and, on examination, found pus oozing from under his tongue.

Examination.—Examination revealed a large mass on the right side in the floor of the mouth. On placing a finger over the submaxillary gland on the outside, and another finger over the area in the mouth, a heavy purulent discharge could be seen at Wharton's duct. On careful "milking" of the gland, the discharge became profuse and enlargement of the floor was reduced. It was difficult to detect any hard mass, but there was no question that there was an obstruction in the right duct.

Roentgenograms of the teeth revealed one infected tooth in the mandible and none in the maxillae, although the teeth were in a generally neglected condition. Roentgenograms of the mandibular region showed a rounded calculus situated approximately at the orifice of the submaxillary duct, the size of a large grapefruit seed.



Right submaxillary area showing rounded calculus. The position indicated is at the orifice of the duct.

Treatment.—The patient was advised to use warm saline mouthwashes in the hope that the calculus would be expelled spontaneously. On the following visit, the gland was again carefully "milked" and again a rusty purulent exudate was obtained. After four days of this treatment, it was decided

that the calculus was too large to pass the opening of the duct.

Operation.—It was difficult to pass a fine probe more than a few millimeters before striking the calculus. Procaine was injected along the floor of the mouth following the duct. An incision was made over the duct and the calculus exposed. It was smooth and creamy in color. It was located about 5 mm. from the orifice of the duct and extended about 5 cm. within the duct.

The entire calculus was removed *en masse* from its crypt. It had assumed the outline of the duct and was about 10 mm. in greatest diameter and tapered as it reached the opening of the duct. The outer wall was thin. The body of the calculus was made up of small irregular masses generally round in appearance, only one of which was sufficiently large and dense enough to be radiopaque. This was the only one that was seen in the roentgenogram.

Outcome.—The purulent discharge continued from the duct for about three weeks, and then finally subsided. The wound healed completely. The swelling under the right jaw disappeared and the discharge of pus into the mouth ceased. The patient suffered no more attacks of tenderness in the region of the right submaxillary area. A year later, he was in good health with no discomfort referable to his past trouble.

Comment.—It is interesting to note that it was possible to demonstrate roentgenographically a comparatively small calculus, yet a much larger mass was removed.

2 East Fifty-Fourth Street.

REGISTRATION OF CENTRIC RELATION IN COMPLETE DENTURE PROSTHESIS

By Homer Simpson, D.D.S., Dallas, Texas

CENTRIC relation of the mandible to the maxillae is the key to all functional positions and relations. This relation is the starting point or basis of all engineering in the building of properly constructed artificial dentures. The relation is so important that it should be obtained by some scientific method, with instruments easily accessible to the profession, and whatever procedure is used should be constant and dependable in the hands of any operator.

When we consider the importance of centric relation, we at once brand many individual methods and devices that have been used in the past as untrustworthy. Such methods as holding the jaw back on closing the mandible, elevating the tongue and having the patient swallow as he closes the jaw, and the like, are condemned for the paramount reason that they are unscientific and always carry with them the fallacy of guess. Methods of this type could not assure the same result in the hands of two different operators.

The most accurate and dependable registration of centric jaw relation is made and transferred to the mechanical appliance or articulator by a graphic tracing, made with central bearing and the use of plaster check-bites or the equivalent.

Honor is accorded the men who have pioneered in developing and promoting a scientific technic in this procedure.

Read before the Section on Full Denture Prosthesis at the Eightieth Annual Session of the American Dental Association, St. Louis, Mo., October 27, 1938.

Credit is accorded wherever it is due and comment will be made on outstanding work of some of the leading men.

Different approaches and technics have been responsible for the development of many different types of instruments. With many of these instruments, the result was good and a foundation was laid for progressive development, while more recent correlation of scientific principles and mechanical devices has simplified our procedure.

The disturbing element in the use of the graphic tracing came not from any question in the minds of the initiated as to the scientific accuracy of the records produced, but from a lack of full understanding of its use and application. Many operators have failed to realize the necessity of establishing a scientific centric jaw relation when dentures were to be built on a plain line or arbitrary articulator. Such an idea is misleading. The more technical detail deleted in the construction of a set of artificial dentures, the simpler the technic, and the more important a true centric jaw relation. Centric relation taken with a biscuit bite or on ordinary bite-rims is almost always in error in vertical or lateral thrust, if not in protrusion. The error is more often a component of eccentric positions.

Much confusion was caused in the minds of many operators by combining the graphic tracing with other steps in technic. The technic has been combined with impressions, facebows, facebow transfer equipment, locking devices, face indexing records and many combinations of intra-oral and extra-oral procedure or records that had to be taken together. Again, trouble arose when records were produced by instruments that could be used only with other specially built or complicated instruments, articulators or equipment. There might be no just criticism of special technic or mechanical procedure as regards the ultimate result with various methods, yet the complications encountered did deter and confuse the uninitiated.

The applicability of the graphic tracing is best understood and the tracing is most valuable if treated as an independent part or operation in technic. If we respect the graphic tracing of the jaw movement as an indexing factor from which to start our work, we realize the value of the tracing. We are no longer concerned as to whether the tracing is made on an upper or a lower plane or whether it gives an index pointing forward or one pointing backward.

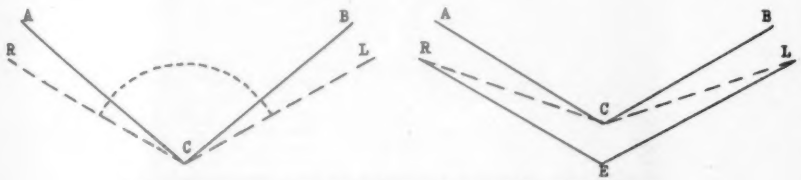


Fig. 1.—Showing form of graphic tracing and functional range.

Whatever equipment is used in the graphic tracings should be usable with the simplest or the most complicated articulators or correlating devices.

The graphic tracing made under central bearing and combined with the plaster checkbite enables one to transfer the occlusal relations of the jaws to the mechanical instrument. Naturally, the more accurately the mechanical instrument reproduces these various relative positions, the more surely the operator can approach the individual anatomic requirements of the patient. The adjustable instrument should be capable of supplying movement directly from centric position to the recorded lateral and protrusive

positions or, more desirable, through the functional path.

If the tracing is taken of the edentulous case, at a point equal to the incisal border of the natural teeth, the lines of lateral range of jaw movements converge to form a definite angle or point. This point, if obtained by unstrained lateral movements of the jaw, represents the true and acceptable centric jaw relation or starting point. This angle, so established, always presents a definite included angle averaging about 120 degrees, which would be represented as angle A.C.B. in Figure 1. It is this included angle or range with which we are concerned in denture construction. The articulator used should permit a range of movement slightly greater than the included angle. The wider range to be selected to compensate for the opening component and cusp height would be represented as the included angle R.C.L. The drawing on the right shows the relative increase in range when a second tracing R.E.L. is taken to compensate for cusp height. The new included angle R.C.L. is relatively the same in either case. If this extra range or freedom is permitted, it has largely the same effect and advantage as has freeing the occlusion of the artificial dentures by careful milling. However, the teeth may be so carefully set from proper records as to need no post-milling. If the articulator used does not permit a range of component protrusive and lateral positions equal to or greater than the included angle of the tracing in all functional range, occlusal thrust will be created on the ridges by the dentures. It is arbitrary and relative whether the allowance for cusp height is imposed by

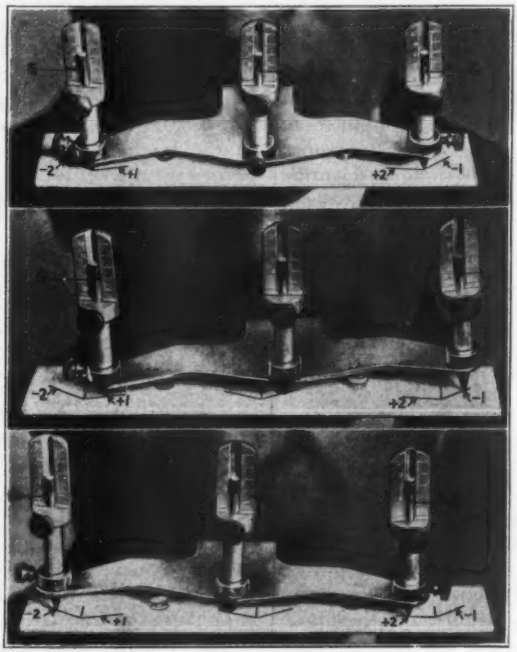


Fig. 2.—Phillips graphic recorder, showing centric and right and left lateral positions with elevational change.

raising the central bearing screw and registering the eccentric elevated positions, or whether one makes the arbitrary changes on the articulator, provided the articulator compensates for such adjustment and the case has been mounted with the facebow with due regard for the functional hinge axis. However, changes made in the elevation and incorporated in the checkbite insure the greatest accuracy.

Due caution should be exercised in the laboratory procedure to maintain the established centric relation in the finished dentures.

The graphic tracing may be used satisfactorily as a guide when taken either intra-orally or extra-orally, but, in either instance, the best results are more easily attained by the use of central bearing pressure between the mandible and the maxillae.

Records taken in this manner are paramount in value. They can be made to record any number of positions of the mandible to the maxillae and other information relative to special technic. The central bearing may be used also to establish the graphic tracing. Such a tracing may be made on a wax coated surface on metal, on a second or thin metal auxiliary plate, or it may be traced directly on an indexing metal plate made of alloyed metal sufficiently strong to stand all the vertical thrust of the jaws without bending and still soft enough to take an indelible tracing from a smoothly pointed central bearing pin. This makes a permanent record and gives fine detail.

In the use of extra-oral methods, many combinations are possible. Dr. Gysi was one of the first to introduce and popularize the graphic tracing, terming it the "gothic arch tracing." The term is frequently used in reference to technic.

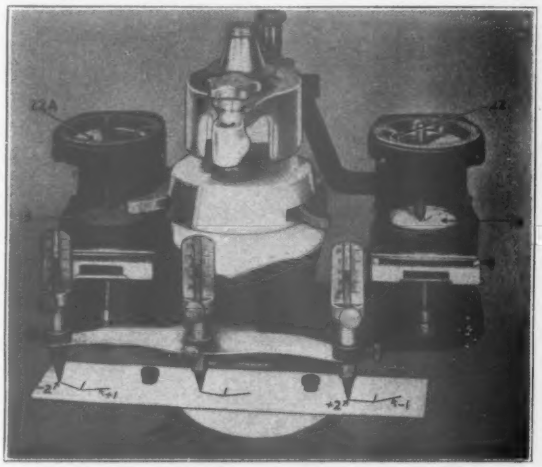


Fig. 3.—Phillips occlusoscope with graphic recorder in place for adjustment of instrument.

The tracings by Gysi were made at or near the incisal border of the anterior teeth. The more recent developments of Gysi are appliances which make an extra-oral tracing on a wax coated metal plate. The instruments are used in combination with the facebow to indicate the vertical change in the condylar path as a dual operation.

Dr. Phillips introduced one of the first appliances to combine central bearing with extra-oral dual tracings and also recording the vertical change in elevation

at respective positions, as shown in Figure 2. This method is of particular value in the transfer to and adjustment of certain types of instruments. This method is scientific and accurate and was one of the first methods introduced which embodied the factors in the modern checkbite. It gives complete information as to both working and balancing condyles and elevations. The appliances require no attachment between the bite-rims to make the transfer to certain types of instruments. The transfer and adjustment of the instrument from such appliances are shown in Figure 3.

Dr. Sears introduced the well-known dual tracing instrument known as the "trivet" (Fig. 4), which shows improvement in tracing tables and technic. Plaster anchorage is used to give the equivalent of the checkbite, and any number of relative protrusive or lateral positions may be recorded by returning to the mouth and setting new plaster anchorage at any desired eccentric position. The plaster is used extra-orally and the instrument employs the desired central bearing.

Fig. 4.—Sears trivet.

Dr. Stansbery has popularized the extra-oral tracing in combination with central bearing and the plaster checkbite. This combination is simple and efficient. (Fig. 5.) These instruments permit the operator to make uniform checkbites of centric and eccentric positions from a

predetermined mounting of the casts. Positions recorded are based on the graphic tracing, and the checkbite produces a permanent record of the positions for setting the instrument and milling the teeth. The method gives special information on elevational change for compensation for cusp height and relative positions in any range of functional occlusion. Such checkbites are very practical in the use of modern instruments and are adaptable to a wide range of variations and usage. Figure 6 shows the use and value of the checkbite in mounting the casts and adjusting the tripod.

Dr. Terrell has developed a modern type of tracing appliance employing central bearing, dual tracing, indexing features and a mechanical arrangement that extends the usage of the plaster check-

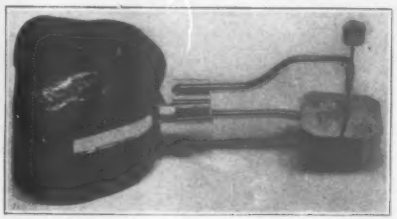


Fig. 5.—Stansbery tracing and check-bite instruments.

bite. (Fig. 7.) Figure 8 shows further use of the graphic tracing in setting the adaptable guides of the Terrell instrument, the precision coordinator, and adjusting the fully adjustable anterior guides of the instrument from the graphic tracings and the checkbites.

Dr. Hight has done a great deal to further the use of the graphic tracing in establishing centric relation. He has contributed much to dental literature on the subject and has designed several appliances for securing the tracings. One of his more recently designed instruments is shown in Figure 9. His appliances are designed to be used with central bearing, if desired.

Dr. McCollum has introduced a most modern instrument for making graphic tracings and records of jaw relations. (Fig. 10.) The instrument records the form and slant of the condyle paths as well as the path of the Bennett movement, together with the centric position of the mandible. These records are transferable to an articulating device and from such records the ability of an articulating instrument to reproduce the relation of the jaws may be judged. This is a most efficient procedure and desirable for most careful technic and research work. When used with the proper instrument, it makes for exceptionally fine results. A central bearing point is used to relieve any interference with the physiologic movements

Fig. 6.—Stansbery tripod.

of the mandible. Figure 10A shows the completed mounting on the gnathograph.

I have designed two types of instruments for taking intra-oral and extra-oral tracings of mandibular movements and position, embodying the essential factors in other instruments. No claim is made for origination. The instruments do have some advantage in ease of application and adaptability. They require no premounting. The bearing screw and tracing pin are contained in the vault of the upper arch; which permits more

freedom of the tongue. There is no impediment to the study of esthetic contour of the lips and face in establishing the vertical dimension or working to pre-extraction records or the use of profile cards or appliances. They require only one set of bite-rims. They can be used on a full upper case with natural lower teeth, or on a full lower case with natural upper teeth. The vertical elevation can be changed while the appliances are in the mouth. They may be used on partial cases. They supply exceptionally good and easily obtained indexing lugs on the checkbite. Figures 11 and 11A show the instruments designed for extra-oral dual tracing with the intra-oral slip joint, is made. After the tracing is made, an indexing dent, if desired, is made in the plate at the centric position, to insure position while the checkbite is being set. This type of appliance meets all requirements. The appliances may also be used to take full upper and lower impressions under central bearing. (Fig. 12A.) This type of impression has many desirable features, each step in impression, bite and occlusion being produced under the same desired functional stress.

It will be noted that the several instruments referred to and designed by different men use central bearing as a required factor.

A true centric relation at the correct

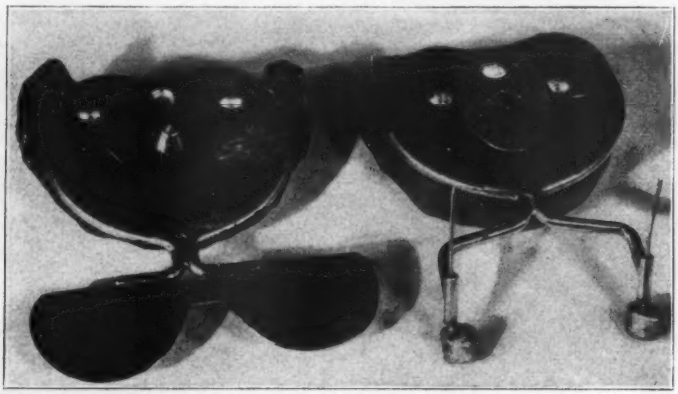


Fig. 7.—Terrell tracing appliances.

so that the protruding parts may be removed at any time for convenience.

In actual working experience, the simpler instruments, shown in Figure 12, are more easily applied and adjusted. The indexing plates are heated and pressed in place on the compound bite-rims and adequate working space is allowed for the plaster checkbite. The appliances are first adjusted to acceptable vertical dimension and the tracing is made on the metal plate. Selecting the desired vertical elevation is a chair operation, and the elevation should always be determined before the graphic tracing or accepted vertical elevation is the greatest help that can be supplied in esthetic restoration and expression. It assures the greatest functional efficiency and offers the surest protection against friction and trauma on the edentulous ridges.

In reporting the value and application of centric relation in full denture procedure, we are justified in stating that a graphic tracing is imperative in every edentulous case.

The extra-oral, dual, graphic tracing with the plaster checkbite furnishes all the information needed to adjust any fully adaptable articulator or positional

relation instrument to relative positions. The intra-oral tracing made with the central bearing tracing and the respective plaster checkbites supply the simplest and most efficient technic and furnish all the information needed.

The use of central bearing in taking the graphic tracing is the best known method of holding the mandible in a simplicity as to be accessible to and practical in the hands of any operator.

1324 Medical Arts Building.

DISCUSSION

David W. McLean, Los Angeles, Calif.: Dr. Simpson has presented some principles of full denture prosthesis so important that one cannot but concur

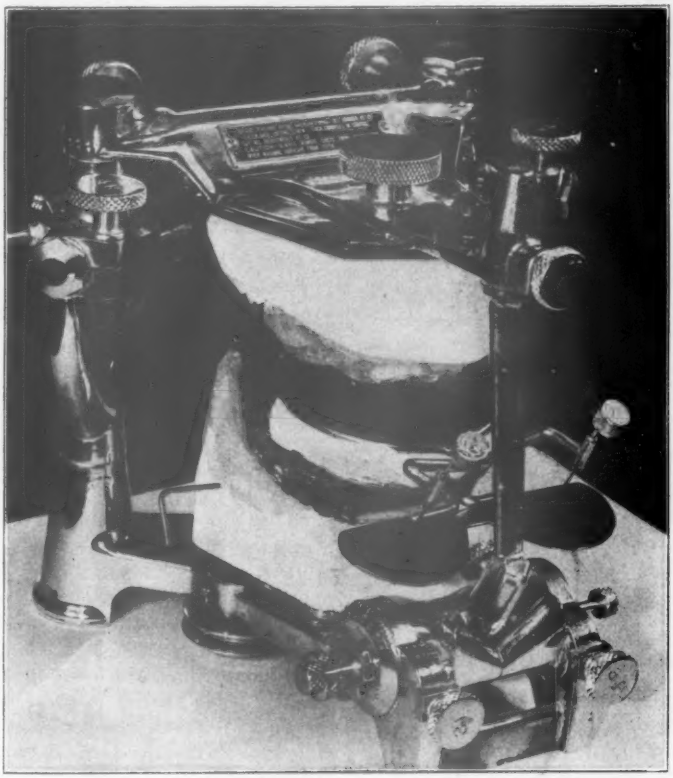


Fig. 8.—Terrell precision coordinator with tracing instruments and check-bite in place.

state of stable equilibrium, controlling the muscular forces and compensating for resiliency of soft tissues.

It is further accepted that the graphic tracing supplies an accurate and a scientific starting point and is trustworthy in denture construction. The application of the principle can be reduced to such with him in reviewing and emphasizing them.

When Gysi offered the gothic arch tracing to replace a single closure on a wax blank, as a means of registering denture relationships in various masticatory jaw positions, he gave us a new basic principle. The importance of the gothic arch

tracing lies not in its form, or the question whether it is made intra-orally or extra-orally, but in the fact that it represents not one jaw closure, but the aggregate of many jaw movements in a prescribed level of closure. Have the patient stamp down on a wax blank in any selected jaw position, and you are taking a shot in the dark. Make a gothic arch tracing and you work on the principle that "fifty million people can't be wrong." The patient may make the initial closure in a wrong position, but when he starts making repeated jaw movements in the level of jaw closure, the jaw drops back to its normal envelop or range of masticatory movement. If obtained in wax, centric registration should employ the same principle of many jaw closures rather than one.

Fig. 9.—Hight tracer, with central bearing plates, mounted on base-plates with bite-rims.

The functional objective of masticatory jaw movements is to drag the mandibular denture across the maxillary one, and so the combined effect of opposed cusp ridges is to constitute a multibladed shearing mechanism. The important thing is the relationship of one denture to the other. Jaw position and condyle movements are but means to that end.

When the jaw moves from centric to right lateral position, the mandible and bite-rim move laterally and tip from the horizontal plane to a canted angle. These two elements constitute the right lateral relationship between the denture bases. If these two elements can be faithfully registered and applied to the adjustment of adequate articulator controls, they will automatically reproduce the condyle movements which originally resulted in the jaw position and denture relationship.

Now, if the mucosa is compressed more on the right side of the mouth than on the left, the cant of the denture base from horizontal will be increased and that much error will be thrown into the articulator controls and into all future denture relationships produced on the articulator. It is this fact which gives importance to the basic principle given us by Phillips in his central bearing point. The force of jaw closure is distributed from a central point; mucosa compression will be uniform throughout the dentures, and the normal cant from horizontal will not be distorted by error induced by uneven mucosa compression.

Stansbery gave us the third basic principle for bite registrations. The central bearing point must move freely; there must be a visible indicator of its position, and we must have a registration medium which it is easy to introduce and control and which cannot be compressed, stretched or otherwise distorted after it is made. The extra-oral gothic arch indicator and the plaster registration are the expression of this third principle.

Frequently, the patient tends to move the jaw laterally or protrusively out of the designated position while the plaster is setting. Let us say he has an urge to push his jaw toward the right. If the central bearing point is locked in a dent in the supporting plate, the mucosa on the right side of the mouth will be compressed by the pressure, and the compression on the left side will be lessened. The result is that the denture base will be

tipped, the cant from horizontal will be increased and one of the two elements constituting the bite registration will be wrong. The condylar inclinations on the articulator will therefore be wrong and so will the occlusion developed on an articulator adjusted by this bite registration.

Fig. 10.—Above: McCollum tracing device complete on face and with stone placed around vice studs ready for transfer to mounting frame and gnathograph. Below: Mounting complete on gnathograph. The locking studs are removed by taking out the screws and the instrument is adjusted to follow the correct path of functional occlusion.

If the dent in the gothic arch plate is shallow, so the point can slip out of it when the patient pushes the jaw to the right, the mucosa compression will right itself before the plaster sets and the cant from horizontal will be correct. The other element of the registration, however, the lateral position of the bite-rim, will be wrong. And since the bearing point is surrounded by plaster, the error cannot be detected until the dentures

are tried in the mouth. While I have admired the ingenuity which locks the central bearing point while the plaster registration is setting, I have been obliged to accept Stansbery's contention that the central bearing point must be free to move so that the cant of the mandibular bite-rim from horizontal will be correct, and the indicator must be visible so that we can know its lateral position also to be correct.

tients have had malocclusion or cuspal interference which has led them to unconsciously reach forward, or diagonally forward, to a jaw position in which there was satisfactory intercuspation of the malposed natural teeth.

These patients will give gothic arch tracings that are normal in form, but eccentric in location. My observations in the orthodontics and pathology clinics of a large university have convinced me

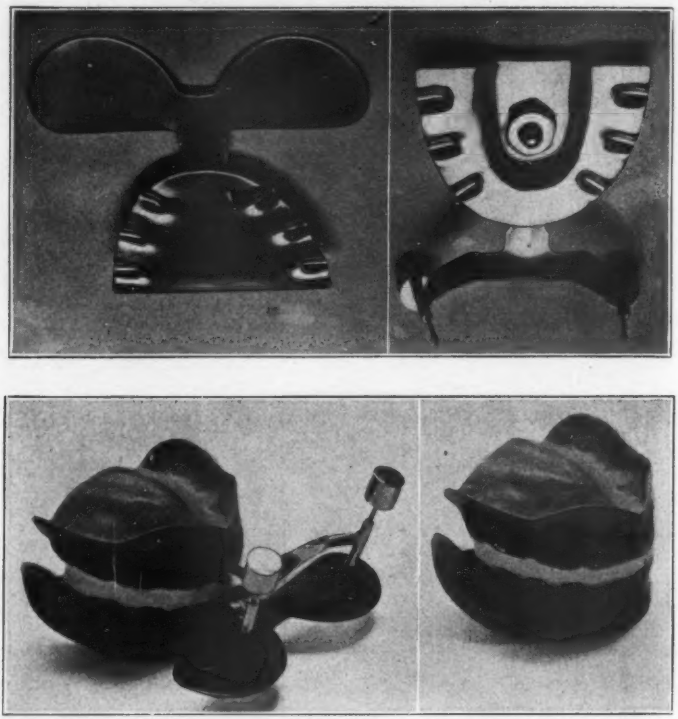


Fig. 11.—Above: Author's tracing instruments with slip joints, extra-oral tracing table and dual tracing pins. Below: Author's tracing instruments with check-bites in place and showing instruments with extra-oral tracing devices removed.

I believe that every patient should be subjected to reasonable retrusive restraint to prevent protrusion during the making of bite registrations, for the reason that in many persons function always has been in an eccentric or convenience relationship. A surprisingly large number of pa-

that the possibility of a convenience relationship must always be borne in mind in making bite registrations. Dr. Simpson is correct in stating that correct centric relationship is the basis and starting point for all denture procedures. I shall go farther and say it is the basis

of all procedures in all fields of dentistry. Failure to make it so leads to pathosis and a great deal of other trouble.

Dr. Simpson is correct in stating that the level of bite closure is most safely changed in the bite-rims, at the chair.

I should like to go farther still: There is a vertical component, or vertical opening, in every lateral and protrusive movement of bases which carry teeth. This is because the cusps must ride up the opposing cusp planes from the bottoms of the sulci to the peaks of the cusps. The amount of opening varies, but averages about 2 mm. Some of this opening, and in some cases all of it, takes place on the hinge axis of the temporomandibular joints.

In the three dimensional Stansbery tripod, this opening is incorporated in the bite registrations and the condylar inclinations of the three controls of the instrument. In all hinge axis articulators, this opening takes place on the hinge axis of the instrument, induced by the

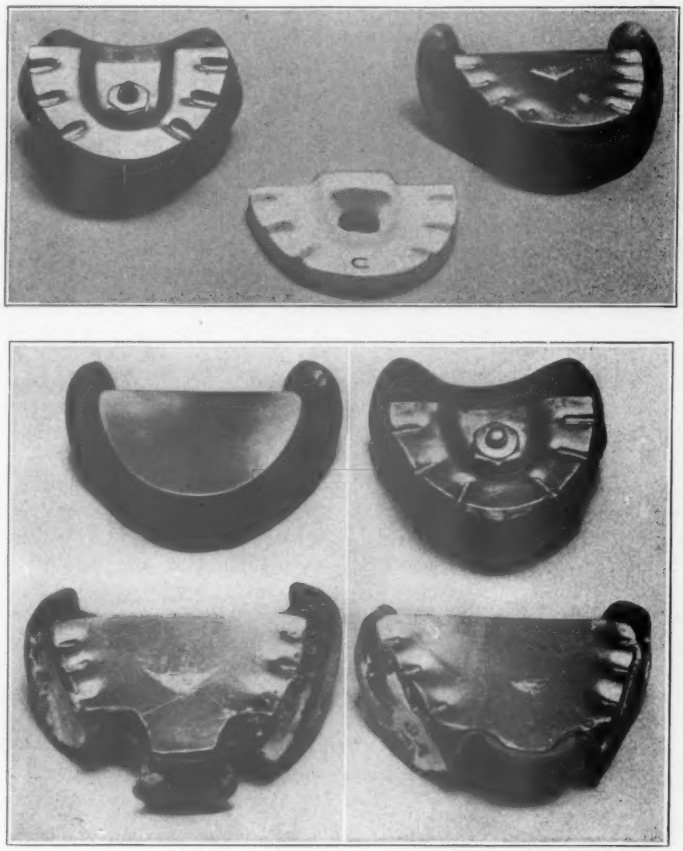


Fig. 12.—Above: Author's tracing instruments of simpler type. Below: Tracing instruments used in impression work and in obtaining jaw relations in partial cases.

action of the cusps themselves or by the incisal guide pin riding up an inclined plane. When a hinge axis instrument is used, an accurate orientation of the models by means of an accurate application of an accurate facebow is necessary. Otherwise, there will be minor interference between opposed cusps during functional jaw movements. Incorrect orientation to the hinge axis is also apt to result in centric interference between the dentures in the last millimeter or two of closure in centric relationship. The posterior teeth strike on the inclined planes of cusp ridges. The upper denture is thrust distally and the lower one mesially. The result is interstitial stress and friction in the mucosa under the dentures and an increased tendency to ridge resorption.

In closing, I would compliment Dr. Simpson on his able presentation and express my appreciation to Dr. Schlosser for having brought before the Section a discussion of such important basic principles. We have on our dental programs too large a proportion of the mechanics of technic, with not enough discussion of the underlying principles upon which the technics are based.

Wilfrid H. Terrell, Pasadena, Calif.: I agree with Dr. Simpson that, when taking centric relation, we should use some scientific method which will have the same results if the procedure is repeated, and should condemn all methods which rely upon the fallacy of guess as to accuracy.

A good definition for centric position is that most retruded position of the mandible from which lateral excursions can be made. The use of some graphic method of tracing the protrusive and lateral movements of the mandible makes it possible for us to locate definitely the intersection of these lines of movement which give us centric position. Most of the so-called bite methods are very inaccurate. They fail to equalize pressure, and seldom can the same position be secured twice in succession. There is no way of knowing, even then, that the centric position is correct, and only after the dentures are completed and placed in the mouth do we find that something has slipped and we have missed the bite. Remakes, disappointment and inefficient dentures are the result.

If dentures are made on a plain line articulator or a partially adjustable instrument, it is still as important that correct centric position be secured. It is the principle involved and not the means that is most important. We have a number of devices for obtaining accurate maxillomandibular relations. Most of these, if used intelligently, will give equivalent results.

When check-bites are used to adjust an articulator, the instrument must have a range of movement which is equal to or greater than the patient's range of movement; otherwise, it will be impossible to adjust the instrument to the checkbites, and the finished case will not function in the mouth as it does on the articulator.

Dr. Simpson has written a very comprehensive paper on this subject and one which will serve as a stimulus to many to adopt more scientific methods in complete denture prosthesis.

AN ACCURATE METHOD OF DETERMINATION OF ALVEOLAR BONE RESORPTION

By Jerome S. Grosby, D.D.S., St. Louis, Mo.

WITH all of the forward strides made in dentistry and medicine, we may be lulled to a false sense of security and satisfaction. The thinking practitioner, however, who has preserved the scientific viewpoint, will freely admit that our knowledge is all too limited. We must admit that whenever an additional bit of information can be gained, we are bound to grasp it and in its use add to our limited storehouse. Like the detective (fictional or actual), we must overlook no clue that will lead us to a solution of our problems.

In the field of diagnosis and periodontia, there are many missing links, many loopholes that by time and persevering research we may hope to close. One of these is the question of a reasonably accurate determination of the amount of alveolar bone change that has taken place over any given period of time. Superficial and hasty examination of this problem may lead us to the false conclusion that comparative roentgenograms are the answer. This is only partially true. Comparative roentgenograms alone do not present the correct information because rarely are the angles and resultant pictures identical. Usually, there is sufficient variation to make our conclusions merely approximations and largely guesswork. So often does this occur that, in sheer desperation and dissatisfaction, an attempt was made to find a means whereby the degree of error might at least be partially reduced. The method devised, while not perfect, will usually give a reasonably accurate determination with a minimum of error. The method is not so complicated as it appears on first impression.

Let us assume the existence of two x-ray pictures, taken one year apart, of the lower anterior teeth. The first picture may have been taken elsewhere and no knowledge of the angle used is known. The second picture may give evidence of foreshortening or elongation as compared with the first. Obviously, a comparison between the two as to alveolar structure will not give a true index of the bone change. The method here suggested involves determination of the degree of foreshortening or elongation that has taken place and, if this is known, the degree of actual bone change can be computed. The formula used is as follows:

$$\frac{\left[B - \left(B \times \frac{A-A'}{A}\right)\right] - B'}{B - \left(B \times \frac{A-A'}{A}\right)} = X$$

This formula may be reduced to the more simple mathematical term

$$1 - \frac{A \times B'}{A' \times B} = X$$

Where,

A = Length of tooth image in first picture.

A′ = Length of tooth image in second picture (foreshortened).

B = Height of bone image in first picture.

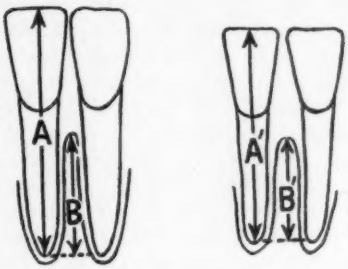
B′ = Height of bone image in second picture (foreshortened).

X = Percentage of actual bone change (no foreshortening).

The measurements of the tooth image on the roentgenogram are taken from the apex to the incisal edge (tip of cusp in posterior teeth). The bone measurement is taken from a point at the same level as the tooth apex to the alveolar crest as shown in the illustration.

For practical purposes, it may be assumed that the true tooth length is con-

stant and the amount of wear that has taken place can be disregarded. This gives us a definite measurement from which to work. The change in length of the tooth image therefore is produced only by the change in angulation and the percentage can be determined $(\frac{A\text{-}A'}{A})$. This, when applied to the change in alveolar bone length, will give the amount of change due to differences in angulation, and the net change resulting from bone resorption can readily be computed as in the foregoing formula.



A, A′, length of tooth image.
B, B′, length of bone.

As a specific example, let us take the accompanying measurements (a practical experimental case) and work out the problem.

The question naturally arises, how can we prove the correctness of this method? An experiment was devised whereby similar conditions were present, but with actual (as contrasted to image) measurements known. This then became a checked control. The method was as follows: Two pieces of wire of different but known lengths were placed over an x-ray film and set at an angle to the film packet. A roentgenogram of the wires was then made. Next, the smaller of the two wires was cut shorter by a definite amount (comparable to alveolar bone resorption). By actual measurement, we determined the percentage of wire removed (bone resorbed) and again took a roentgenogram of the two wires, changing the tube angulation.

Comparing the two pictures and applying the formula, we determined the percentage of the wire that had been cut off. Checking against the actual wire measurements, repeated experiments at various angles and wire lengths showed a remarkable identity with computed results. In every case but one, the actual and computed percentages were identical. One experiment, in which the angle was very extreme, showed a discrepancy of 0.1 per cent. Owing to the presence of various uncontrollable factors, I do not believe results in practical cases would be so accurate, but a reasonable degree of correlation can be expected. Cer-

$$\frac{\left[B\text{-}\left(B \times \frac{A\text{-}A'}{A}\right)\right]\text{-}B'}{B\text{-}\left(B \times \frac{A\text{-}A'}{A}\right)}$$

$A = 35$ mm.
$A' = 31.25$ mm.
$B = 23.75$ mm.
$B' = 15.5$ mm.

$$\frac{\left[23.75 - \left(23.75 \times \frac{35.0\text{-}31.25}{35.0}\right)\right] - 15.5}{23.75 - \left(23.75 \times \frac{35.0\text{-}31.25}{35.0}\right)} \times 100 = 26.9\%$$

Alveolar bone change

Or in its simplified form,

$$1 - \frac{35 \times 15.5}{31.25 \times 23.75} = 26.9\%$$

tainly the results should be far less haphazard than they are now.

This method gives one more bit of information, a clue that may materially aid us in solving another of the many problems that beset us from day to day. We need no longer guess at the amount of alveolar bone change, and it should mean much to us and the patient to have a definite knowledge of what is taking place.

634 North Grand Avenue.

AN IMPROVED METHOD OF CULTURING ROOT CANALS

By MAURICE BUCHBINDER,* B.S., D.D.S., and ARTHUR H. WALD, D.D.S.,
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THE progress of root-canal therapy from the realm of pure empiricism to the status of a surgical science may be considered one index of the progress of dentistry as a health service. The need for this transition has been indicated since the rise of the modern concept of focal infection. Bacterial culture and study of the root canal for final proof of sterility is one of the essential steps in this progressive approach, and although much careful work has been done without it, bacteriologic check-up places root-canal treatment on a much sounder basis.

Bacterial culture technics have been employed for some time[1, 2] as guides and checks on the progress of root-canal therapy. The limited response of the profession to the use of these criteria and technics lies in the restricted facilities of the average office and the impracticability of preparing the media and tubes. Once prepared, it is difficult to maintain these tubes intact, since their size predisposes them to tipping, breaking and spilling, while the cotton plugs do not prevent evaporation and spoiling in a comparatively short time.

It is our belief that a simplified preparation of the culture which involved no technical problems would serve greatly to increase the use of bacterial analysis as well as to establish its inherent reliability.

METHOD AND APPARATUS

For the initial culture in any suspected infection, it is hardly necessary to use the quantity of medium or the large standard tubes that are ordinarily employed. With this in mind, we replaced the 30 cc. tubes with 2 cc. screw-top glass vials. These are the type ordinarily used for medicament dispensation, and they are obtainable with bakelite composition screw tops. Figure 1 shows the comparative sizes of the standard and new form of tubes. The culture medium can be purchased in the dessicated powder form, which is easily dissolved and, in the dry state, will neither spoil nor deteriorate.

If a large number of vials are to be prepared at one time, the broth can be prepared in a separate beaker or casserole in the proportions suggested by the manufacturer, with the simple addition of distilled water to the dry material, 1 to 1.5 cc. of solution being allowed for each vial. If only a few are to be prepared, the powder (as measured with a small suitable measure) is placed in each vial and 1-1.5 cc. of distilled water added.

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The tubes are at this time mechanically clean, but need not be sterile. The tubes are now tightly closed with the screw caps and are sterilized by autoclaving or boiling. For all practical purposes in clinical use, this may be accomplished in the ordinary sterilizer by boiling the tube and contents for one-half hour. This is insufficient for sterilization in a massive contamination by spore-bearing organisms, which requires temperatures obtainable only by the autoclave. This is, however, of only theoretical implication, since, in the hundreds of tubes that we have used, none have failed to become sterile. If the autoclave is preferred, care should be taken to maintain the tubes in an upright position, since the excessive pressure within the tube may tend to expel a small amount of liquid if the cap is faulty. A domestic pressure cooker is quite practical for autoclaving.

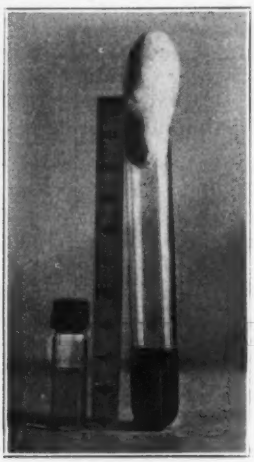

Fig. 1.—New type of tube compared with standard size.

A reliable check on the sterility of the prepared tubes can be obtained by incubation for a period of two days after preparation. This is especially convenient if a stock of tubes are prepared at one time, and are to be kept on hand for immediate use as required. These tubes, once prepared, are stable, and the contents will not evaporate or spoil, cannot spill and may be stored ready for instant use for any length of time.

CULTURING

The technic of obtaining the culture has previously been adequately discussed by others[1, 2]; but to review briefly:

1. The tooth is isolated with a rubber dam.
2. The dam and outside of the tooth are sterilized with iodine and alcohol.
3. The canal is opened with sterile instruments.

Fig. 2.—Positive, cloudy culture (left) and negative, clear culture; after incubation.

4. A sterile cotton point is inserted to the apex and some of the moisture is absorbed. Sufficient time is allowed to elapse for the absorption (one minute).
5. The vial is opened and the mouth and cap are flamed quickly.
6. The cotton point is dropped into the vial.
7. The mouth of the vial and the cap are flamed and the vial is tightly closed.

INCUBATION METHODS

The problem of incubation, because of the small size of the tube, is minimized, and the incubation chamber can be easily made[2] or purchased. It is also possible

to carry one of these tubes in the vest pocket, which is a fairly serviceable emergency incubator.

Determination of the result may be made microscopically or merely by inspection. A positive culture is indicated by a cloudy, translucent solution (Fig. 2) as compared with the crystal clear brownish sterile medium. If further information as to the character of the organism is desired, the usual subculture and microscopic methods must be employed.

APPLICATIONS

This simplified culturing technic has a variety of practical applications in the medical as well as the dental field. If, for instance, an agar-infusion medium is employed in place of the broth, the medium may be chilled while the tube is inverted. This serves to occlude the mouth of the tube with a mass of agar, which is readily accessible for stab cultures in the determination of anaerobic or gas-forming bacteria.

If, on the other hand, the agar is warmed before inoculation, an actual bacterial count may be made.

This is accomplished by inserting the inoculant in the sterile liquefied agar, shaking the mixture and permitting it to cool. The bacteria will, on incubation, grow out in visible colonies. After incubation, the discrete colonies can be counted or estimated and will serve as an index of the amount of infection present.

Other variations of stabs, slants and broth cultures are easily adaptable to these small tubes, their convenience promoting their increased use.

DATA

How reliable are the new tubes? A preliminary series of fifty-eight teeth have been cultured by this method, with the standard cotton-plugged autoclaved 30-cc. tubes as control. In several cases, there was failure to agree, but rechecks confirmed the findings on the small vial. The total number of cultures made was fifty-eight; number in agreement, fifty-two; not in agreement, six. In each case of disagreement, the small tube was positive and the standard one negative. The medium in each type of tube was the same, brain-heart infusion, pH 7.4. The amount of inoculum on the cotton point was approximately the same for the small tube as the standard one in any given case. All work was done in the root canal clinic of the School of Dental and Oral Surgery, Columbia University.

We believe that these phenomena may be significant and may depend on the fact that the lowered oxygen tension in these vials is more nearly comparable to the oxygen tension of the tissue present in the original state of the infection. The idea is compatible with the frequent difficulty experienced in growing an aerobic organism in the initial culture from infections in a place of reduced oxygen tension.

CONCLUSIONS

The method of culturing root-canal organisms presented is much more practicable for the dentist than the usual method.

Its use should lead to an increase in culturing in the office and a better type of root-canal work.

The new method is at least as accurate as the old in evaluating possible sepsis.

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ADVANCED AGE IN RELATION TO DENTAL CARIES IN WHITE RATS

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DENTAL caries has been produced in white rats through planned experiment.[1, 2, 3] Avitaminoses A[4] and D[5] and endocrine dysfunction[6, 7] have been so definitely pictured in growing dental structures that Schour[8] emphasized the kymographic qualities of developing animal teeth. Yet Colyer[9] examined the teeth of 3,800 rodents from the wild state (museum specimens) without finding a carious tooth, although he had noted caries in other species of wild animals. The occurrence of caries in captive animals may parallel the frequency of caries in civilized human races as contrasted to the freedom from caries of primitive human races.

Caries in rat molars has been attributed to the impaction of coarse grain particles in the cusps or between the teeth[1, 2, 3] with subsequent fermentation of the impacted mass. Identical diets with cooked or finely ground particles have been held to be incapable of causing caries. However, none of the animals in the previously mentioned papers reached an age of more than 400 days. While particle size may be an important factor in initiating caries, there is no evidence that caries will not develop when a small particle size diet is fed throughout life to animals attaining an extreme age.

The following report is based upon a study of the jaws of a number of white rats ranging in age up to 1,300 days. These animals were raised in the Laboratory of Animal Nutrition, Cornell University, for the purpose of studying the effects of retarded growth upon the life span, together with the organic and tissue changes which occur when the animals reach extreme age. All the animals died from natural conditions. From a dental standpoint, these animals were of interest because of the nature of their growth and diet and their extreme age.

Through retardation of growth, these rats reached ages far beyond their ordinary life span. This experiment has furnished tissues far older than any heretofore studied. Certainly the preservation of the teeth in these animals is in contrast to the almost uniform loss of human teeth at an equivalent age.

OUTLINE OF THE RETARDED GROWTH EXPERIMENT

These rats were started on the experiment at 3 weeks of age. They were divided into three groups, two control groups and the retarded group. The two control groups were allowed to mature normally, and the retarded group was restricted by calories only. They were usually allowed to increase by 10 gm. every 100 days by feeding fresh liver sufficient to supply the deficiency of calories in the diet. The retarded diet is given in Table I. In addition, they received 4 drops of carotene in oil daily and ±0.35 gm. irradiated yeast three times a week.

The retarded group were weighed three times a week and the amount of basal diet fed was determined by these weights, and it too was weighed in individ-

Study supported by the Rockefeller Foundation Grant for Research in Longevity, Laboratory of Animal Nutrition, Cornell University, Ithaca, N. Y.

ual daily samples three times each week.

The control groups were fed an average amount of the basal diet per week for each rat representing the average intake of the retarded group. Each week, more sugar, starch and lard were mixed with the basal diet to give the additional calories necessary.

No. I control received the same supplement as the retarded animals, while No. II control received 3 drops of cod-liver oil in place of 4 drops of carotene daily and ±0.35 gm. unirradiated yeast three times a week.

Group III was retarded for 300 days. Then one-fourth were allowed to mature (being treated as part of control I). The rest were divided into three groups, one of which was allowed to mature at

TABLE 1.—RETARDED DIET

	Per Cent
Cooked starch	20
Regenerated cellulose	2
Lard	10
Sugar	10
Salt mix (O & M)	6
Wesson oil	5
Yeast	5
Casein	40
	100

500 days, one at 700 days and the last one at 1,000 days.

McCay, Crowell and Maynard, in reporting a previous study on retarded growth, say,[12] "The rat body still retains the power to grow at these extreme ages." They comment upon the smaller size of the organs of the retarded animals, and the fact that the females required a higher caloric level than the males for maintenance of body size.

In a more detailed account, McCay summarized the "Chemical Aspect of Ageing"[13]:

> Almost nothing is known of the biochemistry of ageing. However, definite advances must be recognized in the discoveries that the life span can be greatly extended by manipulating the diet. Our philosophy need no longer anchor us to the concept of a fixed life span. Evidently there are great gaps in our knowledge of the chemical changes with ageing.
>
> Little hope of progress in studying the process of ageing can exist until special institutes of research are established in which whole groups of specialists will devote their lives to cooperative attempts to solve the intricate problems. The field of nutrition probably affords the most promising line of attack, but specialists in this field must work side by side with the physicists, biochemists, bacteriologists, pathologists, physiologists, histologists and psychologists. Thus far Russia seems to be the only nation that has established such institutes. When these cooperative attacks are made upon the basic problem of age-changes it is likely that the by-products will afford entirely new methods of attacking the diseases of old age such as cancer, arteriosclerosis and those of the heart.

PROCEDURE

The heads of seventy-one animals were cleaned of soft tissues and the twelve molars of each animal were studied under a dissecting microscope at 7 diameters. The dental defects varied from pits definitely penetrating the enamel without fracture of the cusps to extreme attrition of the crowns. All carious and broken teeth were grouped together as representative of the total dental defects. As a study of the teeth had not been planned when these animals died, it was not possible to make stained or ground sections.

RESULTS

As ten days of a rat's life is equivalent to one year of a human being's, these animals average from the equivalent of 64 years in Control I group to 98 years in Retarded IIId group. Yet while 20 per cent of the teeth of the "64"-year-old rats are lost, and 29 per cent of the Control II "67"-year-old rats, the averages of the four retarded groups are only slightly higher.

Forty-two per cent of the mandibular teeth were carious, as compared to 8 per cent of the maxillary teeth. Nine of the animals had no gross dental de-

fects at ages 650 to 950 days. One female in Group IIIc had no carious teeth, bringing her group average down considerably; otherwise, the females tend to have poorer teeth than the males. Control I received the same basal diet as the other animals, while Control II received cod-liver oil, and yet Control II had almost 50 per cent more tooth destruction than Control I.

a large percentage of coarsely ground corn and absent in rats on a diet composed of casein and starch, or of grains the particles of which are finer and softer than corn." Knowlton[10] and Lilly[11] failed to produce caries on a diet containing casein. In the present study, the only element of the basal diet used that can be under suspicion in regard to particle size is the casein. The casein

TABLE 2.—CARIOUS OR MISSING TEETH*

	Sex	Age	Group Av.	Rt. Max.	Lt. Max.	Rt. Man.	Lt. Man.	Per Cent	Av. Per Cent	Rats with Intact Teeth
Control I										
6	♀	597		0	1	8	10	26		2
8	♂	688	642	0	1	4	7	13	20	2
Control II										
8	♀	706		2	0	16	14	33		0
8	♂	639	672	3	3	10	8	25	29	2
Group IIIa Retarded 300 days										
4	♀	717		1	1	5	4	23		1
4	♂	865	791	0	1	5	5	23	23	1
Group IIIb Retarded 500 days										
4	♀	985		5	1	6	5	35		0
4	♂	915	950	0	1	3	4	17	26	0
Group IIIc Retarded 700 days										
4	♀	935		1	1	4	5	23		1
4	♂	873	904	0	0	5	7	25	24	0
Group IIId Retarded 1000 days										
3	♀	937		2	2	4	5	36		0
4	♂	1019	978	1	2	6	5	29	33	1 (almost)
Total				15	14	76	79			

*Twelve teeth per animal.

COMMENT

The inclusion of coarse particle size cereal has been assumed to be the primary cause of caries in white rats. Coarse rice particles[1, 3] and coarse corn particles[2, 14] caused caries, which did not occur when the cereal was finely pulverized or cooked. Shelling[15] states: "The incidence of caries is high in rats containing used in the present experiment passed through a 20-mesh sieve. Sixty-three per cent was retained by a 40-mesh, and 89 per cent by a 60-mesh sieve. Rosebury states[3]: "Rice passed through a 10-mesh sieve is very effective in producing caries, but rice ground to pass a 20-mesh sieve of which about 60 per cent remains on a 30-mesh sieve is almost ineffective."

Thus, there should be nothing in the basal diet used in this experiment capable of producing caries, because of coarse particle size.

There is a steady increase in tooth damage in the older animals, but at none of the ages does the damage equal that to human beings of equivalent age. Hollander and Dunning,[16] in a study of caries in 12,000 persons, state that "caries continues past childhood and adolescence at least until middle life at a slowly and progressively decreasing rate." They also point to the fact that caries is "significantly higher among women than men." In the age group 65 and over, they list the percentage of affected teeth as 24 per cent for males and 27 per cent for females, with affected surfaces at 68 per cent for males and 79 per cent for females. The continuous slow development of caries throughout age and the greater incidence of caries in females are important similarities in both studies.

This study was not designed specifically as a study of caries. Many nutritionists interested in the effect of diet on other parts of the body ignore the effect of oral sepsis and abandon material that would be of interest to the oral pathologist. The inclusion of a dental study in this experiment on longevity is significant recognition of the importance of the teeth in relation to other body tissues.

SUMMARY

The teeth of rats, whose total life span had been greatly extended, were studied to determine the effect of ageing and also the effect of synthetic diets composed of fine particles, fed throughout life. The life span of these rats was extended by retarding their growth for periods varying from 300 to 1,000 days. The normal rat lives only about 600 days. In most groups, the females proved more susceptible to damage to the teeth than the males, in spite of the fact that the females were never allowed to reproduce. Even at advanced ages where the rats were comparable to men aged more than 100 years, a number of cases of well-preserved teeth were discovered.

Caries will occur in white rats fed diets of fine particle size. In normal animals, the incidence of injury to the teeth was slightly higher for those fed cod-liver oil as a source of fat soluble vitamins than for those given carotene and irradiated yeast.

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350 Madison Avenue.

THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION

L. PIERCE ANTHONY, D.D.S., Editor

Published by the American Dental Association
212 East Superior St., Chicago, Ill.

All expressions of opinions and all statements of supposed facts are published on the authority of the writer over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association.

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Subscription is included in the annual membership dues. The subscription rate to non-members is $5.00 a year in advance, this rate applying to both domestic and foreign subscriptions. All foreign subscriptions are to be paid in United States money.

OCTOBER *Editorial Department* 1939

EXTENSION OF PREVENTION OF DENTAL DISEASE

MANY years ago, it became quite evident to the dental profession that if any particular progress were to be made in combating the ravages of dental caries, it would have to be accomplished through the preventive approach.

Clinical application of restorative methods was sound and practical, but it hardly scratched the surface. The enormity of the reparative work to be done, if we were called upon to do it, precluded the probability of the profession's ever attaining sufficient physical equipment to deal efficiently with the situation. As the years have gone by, experience of the dental practitioner has strengthened the observation; and as the need for dental service has constantly increased, it is quite apparent that the task of caring for the dental needs of the public is practically impossible from the restorative point of view.

The profession has, by reason of the recognition of the futility of its restorative efforts, slowly awakened to the desirability of attacking this ubiquitous expression of disease nearer to its source. Pursuant to this thought, efforts were inaugurated to apply dental preventive methods to

the teeth of children, particularly the younger school children. It was soon evident, in our efforts to convince the public of the desirability of such a procedure, that we did not have the actual scientific justification for our belief sufficient to convince a public that was inclined to be skeptical. Our first step in combating this skepticism was the promotion of a program of mouth cleanliness that gave promise of lessening, to some degree, the amount of caries. It seems, however, that not only was the public skeptical regarding such a program of prevention, but also, strange as it may seem, such a plan of procedure did not meet with the wholehearted support of the entire profession. There were those in the profession who expressed definite misgivings about pursuing a program of disease prevention that carried with it the possibility of lessening the demands for their services, and there were those in the public who not only questioned the relation of a clean mouth to general health, but also were inclined to the belief that the profession was inaugurating a business-increasing propaganda under the guise of a public health measure.

It then became evident that our contentions as to the health benefits of elimination of dental disease, as well as the benefits to be derived from dental disease prevention, needed more definite and scientific facts and figures to be convincing to those outside of dentistry. Accordingly, the now notable mouth health demonstrations of Ebersole and Fones were directed toward that end. Ebersole, in the application of the now historical Marion School experiment, proved very definitely that the control and prevention of dental disease, through intelligent attention to the mouth health of school children, would and did materially raise the intelligence standard of the pupil.

The demonstration by Fones, made in the schools of Bridgeport, Conn., and more or less a follow-up of Ebersole's efforts, but on a more comprehensive scale, confirmed in every detail the findings of the Marion experiment. Unfortunately for dentistry, Fones was compelled to discontinue his efforts because of lack of support; but this did not detract from the importance of the demonstration, for it proved beyond question the value of mouth hygiene systematically and intelligently applied as a health measure and as an economic measure to the community. This approach to control of mouth conditions in the child has been extended to many communities, and in every instance it has proved both the close relationship of mouth conditions to mental and physical development and the value of mouth health as a health service to the community.

Hyatt's practice of odontotomy constitutes an earlier approach to

prevention, but for some reason, mostly skepticism, Hyatt's procedure has not been accepted generally by clinical dentistry.

The elaborate experimental studies of mouth conditions in children conducted by the United States Public Health Service in Hagerstown, Md., have furnished further confirmation of the earlier findings of Ebersole and Fones on an elaborate and definitely controlled scale, as an applied scientific procedure to control the mouth health of school children.

The Hagerstown experiment, the first in which the Government and, incidentally, the public have come to the aid of dentistry in its endeavor to demonstrate the value of dentistry as a public health measure, is virtually the only experiment that has been carried to a definite and positive conclusion.

Even with such convincing illustrations as those just noted, the relation of dental disease to general health is not yet fully appreciated by the public and by medicine, and mainly, we believe, owing to the fact that dentistry's preventive efforts cannot yet be applied at the earliest and most logical period in the caries process, namely, at or before its inception.

In a paper in the present issue, Mr. George St. J. Perrott, chief of the the Division of Public Health Methods, National Institute of Health, has applied a statistical study to the various surveys and investigations of dental health service, and one of the important results of the study is to confirm what we, as a profession, have long known—the inadequacy of the present physical equipment of dentistry to care for the dental needs of the public.

Incidentally, and of particular import, is the fact that Mr. Perrott, as the result of his studies, has pointed to the most practical method of approach to preventive dentistry. His findings may initiate in the profession an effort to devise a workable plan of dental procedure that will meet the clamorous demands of the social workers for a dental service that will provide dentistry for the classes of the public which need it most.

We have long felt that both medicine and dentistry should indicate a cooperative attitude toward the governmental trend to provide medical and dental service to all classes, by devising a practical working plan of procedure that will offer some hope of meeting the demands for universal health service. So far as we know, the medical profession has presented no such plan, at least none that has stood the trial test. The dental profession is now apparently taking steps in this direction in the

appointment of a national health program committee, commissioned to formulate such a plan. And we are encouraged to believe that the committee will soon be able to present a plan, or program, that will meet the governmental demands, without, in great measure, disturbing or changing the present character of dental practice.

Whatever our plan of procedure may be, it must be based on the principle of prevention. It is not possible at present for the dental profession to care for the dental needs of the public in any other way; and the one hope we have for some good to come to dentistry out of the present health service agitation lies in recognition by the governmental and philanthropic welfare institutions of the help which dental research needs and must have to solve our most important problem—the etiology of dental caries—and a willingness to supply that help.

Dentistry alone cannot hope to solve this problem, in view of the fact that it involves so many of the other biologic sciences; and when this difficulty is more generally recognized, we may hope for some helpful cooperation in the formulation of a dental health program that will redound to the good of medicine, dentistry, the public, the government and humanity in general.

Incidentally, Mr. Perrott's article is a most valuable contribution to dental science in that it constitutes a statistical study of the records and data, accumulated over the years in dentistry and much needed for many years as authentic scientific justification of our claims regarding the value of dental health service.

Mr. Perrott's suggested plan provides for intensive attention to the teeth of the children in the lower school grades, with the yearly cumulative benefits that will accrue in the succeeding years from this first preventive effort, until eventually the earliest years will be the only ones that will need a great deal of attention. This plan, which has been suggested and tried out in the past, appeals to us as a most practical and common sense procedure, with much promise of successfully meeting the dental situation.

Mr. Perrott makes a thorough analysis of practically all the surveys and studies of dental practice. He offers an observation on the high cost of dentistry, an encumbrance of dental practice that has done much to inhibit its accessibility to all classes, and one that has been a powerful instrument in the hands of social workers in their endeavor to promote socialized medicine and dentistry. He aptly says that it is futile to carry on campaigns of dental health education and then, in effect, turn the public back at the dental office because dentistry is too expensive for the

wage earner. The dental profession is not entirely responsible for this paradoxical situation, inasmuch as it has received comparatively little cooperation from any source. By and large, there has been only the private dental office to serve the public, whereas medicine in all its various phases has had the support of the philanthropic interests, which provide elaborate free clinical service through the hospitals.

Particular emphasis is placed on the need for a plan of health service that will meet the needs of the social security program and Mr. Perrott pertinently remarks that it can be accomplished intelligently and efficiently only through the cooperation of all interests involved. He states that while the Technical Committee on Medical Care of the Interdepartmental Committee to Coordinate Health and Welfare Activities has proposed the integration of dental treatment in a comprehensive national program of health, responsibility for the evolution of plans adapted to local needs rests with the dental profession, and he expresses confidence in the ability of the profession to fulfil this responsibility.

THE PRESIDENT'S MESSAGE

In an effort to arouse a more active interest on the part of all its members in the attainment of the objects, aims and purposes of the American Dental Association, the President, Dr. Merritt, plans to present a short message on some phase of the Association's activities in the issues of The Journal from the current month to the time of the annual meeting in Cleveland.

Accordingly, we are pleased indeed to present a message from the President in the present issue on page 1714, in which Dr. Merritt appeals to each member for active, hearty and whole-souled support of his administration toward the solution of some of the many serious problems and responsibilities that are now confronting the profession.

Now turn to page 1714, read the President's Message, and decide for yourself wherein you can do your bit for 1940, and do it!

COUNCIL ON DENTAL THERAPEUTICS

LISTERINE TOOTH PASTE—NOT ACCEPTABLE FOR A.D.R.

Report of the Council on Dental Therapeutics of the American Dental Association, authorized for publication.

THE following report has been submitted to the Lambert Pharmacal Company. The firm's reply contained the following information:

1. The formula $C_{14}H_{27}O_5SNa$ designates the compound sodium lauryl sulfoacetate.

2. "For reasons purely of manufacturing concern, the use of this vehicle (reducing sugars) was discontinued after a few months and the use of the original Listerine Tooth Paste vehicle, aqueous glycerine, resumed."

3. In addition to the ingredients mentioned in the chemist's report, the firm states, Listerine Tooth Paste contains gum tragacanth.

4. The firm further states that they are in possession of evidence to substantiate the claims that their dentifrice is an aid in the prevention of caries, and that the detergent used does not have toxic properties, according to practical and clinical studies.

The profession will note that the product now marketed differs in composition from that analyzed in the Bureau of Chemistry. The presence of gum tragacanth does not serve to alter the significance of the Council's report. The firm's assertion that use of the product, Listerine Tooth Paste, does decrease the incidence of caries and that the detergent used does not have toxic properties cannot be considered adequate evidence. In the light of the foregoing, and for the information of the profession, the Council's original report is presented here.

ORIGINAL REPORT OF COUNCIL

The Council has received sufficient requests for information on Listerine Tooth Paste (Lambert Pharmacal Company, St. Louis, Mo.) to warrant this report.

The Council has, on several occasions, expressed the well-considered opinion that existing scientific evidence does not support advertising claims to the effect that dentifrices are useful in the prevention, mitigation or cure of dental caries. So far as the Council is aware, no one has yet shown that these agents will do more in the prevention, mitigation or cure of dental caries than will the use of the brush and water alone. Nor has any one presented sound clinical evidence to disprove the accuracy of Black's terse statement on dentifrices and mouth washes: "It is believed that these are of little or no value." (Black's Operative Dentistry, Vol. 3, p. 39.)

The Council recognizes, however, that the use of dentifrices has become a well-established habit and has granted that dentifrices may aid the brush in cleaning the accessible surfaces of the teeth. The formulae and properties of all such agents should be known and, above all, the safety of the products should have been established before they are pro-

moted to the public. On the basis of our present knowledge, it would appear that claims beyond those permissible for cleansing agents to be used in conjunction with the brush are unwarranted. Under any circumstances and as a matter of principle, direct or indirect claims to the effect that this or that dentifrice is of value in the treatment of dental caries or any other dental disease should be based upon direct and sound clinical evidence. In view of the fact that dentifrices may and do vary widely in composition, the evidence adduced and presented should apply specifically to the product for which the claims are made.

After an exhaustive survey of the scientific literature, tempered by years of painstaking research, Rosebury recently remarked, apropos of the subject of dental caries: "It is likely that an unbiased review of extant opinions—even those of 'experts' so-called—would present an aspect of irresoluble confusion. Only recently have attacks upon the problem begun to utilize the discipline of the experimental method." (Rosebury, Theodor: Dental Science and Dental Art. (S. M. Gordon, Ed.) Philadelphia: Lea & Febiger, p. 269, 1938.) The same investigator (p. 322), after presenting practical suggestions for the prevention and control of dental caries, stated: "All of these recommendations are to be regarded as supplementary to the established practices of operative dentistry; the preparation and filling of carious cavities in accordance with the precepts of G. V. Black, which constitute the only universally acceptable treatment of dental caries. Nothing in the foregoing, moreover, should be taken as suggesting that the practice of brushing the teeth be abandoned; it should be encouraged as a valuable hygienic habit; but little reliance should be placed upon it as a preventive of dental caries."

The inescapable conclusion is that the prevention and the treatment of dental caries belong to those who are fitted by training to institute and to carry out and to supervise those measures which have been shown to be effective. Apparently, the Lambert Pharmacal Company is not in agreement with these conservative views.

The New Listerine Tooth Paste, which bears the seal of approval of the Good Housekeeping Bureau and which is advertised in conjunction with Listerine Antiseptic, is promoted with numerous and diverse claims. Space does not permit a discussion of all these claims nor even a mere repetition of all the direct and indirect assertions involved in the promotion of this product. The firm itself has, however, summarized the bulk of its claims as follows: "As the Luster-Foam 'bubble bath' surges over the gums and teeth, here is what it does: 1. Sweeps away food deposits. 2. Obliterates dull, stained film. 3. Combats dangerous acid ferments. 4. Reduces the number of decay germs. What other tooth paste so thoroughly fights decay these four ways?"

According to the advertising claims, the remarkable properties of the tooth paste are due to ". . . Luster-Foam detergent ($C_{14}H_{27}O_5SNa$), the strange, gentle, almost magical ingredient that cleans teeth in a new, safe, delightful way."

It would seem that a product with the alleged properties of Listerine Tooth Paste should be susceptible to a thorough clinical evaluation or that in any event the users should soon be freed of the ravages of dental caries. In the interests of professional and public welfare, to say nothing of conscientious research workers, it would appear to be only just that the Lambert Pharmacal Company present good evidence to substantiate their claims. In the absence of such evidence and in the face of scientific data in the literature, it must be concluded that the claims are unwarranted.

The detergent in the new Listerine Tooth Paste is called Luster-Foam and to it is assigned the formula $C_{14}H_{27}O_5$-

SNa. To any one with even a superficial knowledge of organic chemistry, it is apparent that the designation is uninformative. The molecular formula $C_{14}H_{27}O_8SNa$ might be applicable to many organic compounds. What is of even greater importance is that the pharmacologic and toxicologic properties of the compound are either unknown or are carefully guarded secrets. (An independent investigation of soap substitutes in dentifrices has been published recently [J.A.D.A., 26:1461, September 1939].) In view of the secrecy with which the real nature of this detergent is shrouded and further in view of the fact that the firm has presented no data on their dentifrice even though they were requested to do so, the claim that the product is "extra-safe" is unacceptable.

As can be seen from the chemist's report, the new Listerine Tooth Paste contains a high percentage of reducing sugar. Since the firm apparently subscribes to the chemicoparasitic view of the etiology of dental caries, as is indicated by the nature of their advertising claims, they should present evidence that the reducing sugar contained in the dentifrice does not actually contribute to the incidence of dental caries. It hardly seems reasonable to assume that one component of the dentifrice mixture can "surge into . . . tiny pits, cracks and fissures" without having another and highly soluble component (reducing sugar) perform the same act. Furthermore, if the detergent "combats dangerous acid ferments," it would seem pertinent to inquire whether it also "combats" ferments which are beneficial; e.g., ptyalin, and what the eventual outcome of such "combat" might be.

REPORT OF THE BUREAU OF CHEMISTRY ON NEW LISTERINE TOOTH PASTE

Several packages of Listerine Tooth Paste were purchased on the open market. Each package consisted of a flexible metal tube of paste, an insert advertising "Listerine Antiseptic" and a carton. The reading matter on the insert contained advertising on the halitosis theme. The reading matter on the tube and carton was as follows:

TUBE

Double size New Listerine Tooth Paste. Listerine Tooth Paste contains no soap, grit, chalk, or harmful abrasives. Its cleansing and polishing ingredients are safe and efficient. Its flavor is agreeable; its aftertaste exhilarating. Many use it also in massaging the gums. Lambert Pharmacal Co., St. Louis, U.S.A. "Listerine" Reg. in U. S. Pat. Off. Made in U.S.A.

CARTON

New Listerine Tooth Paste Double Size. Contains more than one-quarter of a pound of Listerine Tooth Paste. Lambert Pharmacal Company, St. Louis, Mo. Net weight 4.2 oz. or 120 gm. Made in U.S.A. Listerine Tooth Paste gives you the cleansing power of powder. . . . In modern, convenient form. . . . Because it is made by "creaming" the safest dental powders into a paste. No grit, no harmful abrasives, no mess, no waste. A grand flavor!

On the exposed end flaps, the words "Listerine Tooth Paste 40¢" appear. On the concealed end flaps, the following appear: "No. B1504 D U S P Printed in U.S.A. New Package adopted 1938. Listerine Antiseptic for Dandruff—the proven treatment. Start the day right—gargle with Listerine Antiseptic."

The carton bore the seal of approval of the Good Housekeeping Bureau.

A mixture of the tooth paste with water lathered when shaken. Addition of a few pellets of sodium hydroxide produced a vigorous reaction and the mixture would no longer lather. Apparently, the detergent is easily hydrolyzed with aqueous sodium hydroxide.

Qualitative analysis indicated the presence of calcium, sodium, phosphate, sulfate, glucose, fructose, water and flavors. Starch, magnesium, silica, chloride or carbonate was not found. The pH as determined by the glass electrode was 5.0.

Quantitative analysis gave the following values:

	Per Cent
Ash	53.0
Moisture (xylene distillation)	23.7
Phosphorus (as P)	3.2
Calcium (as Ca)	17.13
Sodium (as Na)	0.20
Sulfur (as S)	8.77
Reducing sugars (as invert sugar)	22.7

(End of Chemist's report)

On the basis of the foregoing analysis, the composition of Listerine Tooth Paste may be stated approximately as follows:

	Per Cent
Calcium sulfate	36.6
Calcium phosphate	15.7
Reducing sugars	22.7
Water	23.7
Detergent and flavors	1.3

In the light of the foregoing, the Council finds the New Listerine Tooth Paste unacceptable for A.D.R.; i. e., because unwarranted therapeutic claims are made for the product, because the composition of the product is secret and because there is insufficient evidence of the safety of the product under conditions of use.

A copy of the rules that govern the Council in the consideration of articles will be sent on request.

HAROLD L. HANSEN, *Secretary.*

CORRECTION

The Council's attention has been directed to an error which appeared in the report of the Annual Meeting of the Council (J.A.D.A., 26:1192 [July] 1939). In the discussion of nitrous oxide, ethylene and cyclopropane, the sentence "All of these products are subject to the explosion hazard" appeared. This sentence should be revised to read: "Of these, ethylene and cyclopropane when mixed with oxygen or air in certain percentages are highly explosive. Nitrous oxide is *not* explosive when mixed with air or oxygen. When, however, ether vapor is added to the nitrous oxide-oxygen mixture as is commonly done in medical-surgical practice, the resultant mixture is highly explosive.

For practical purposes, such a mixture of nitrous oxide-oxygen-ether is as dangerous as any mixture of ethylene-oxygen or cyclopropane-oxygen, as past experience has amply demonstrated.

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

DENTIFRICES*

Saxon Tooth Paste.—Composition: See Craig-Martin Tooth Paste (A.D.R. 1939, page 110).

Manufactured by the Comfort Mfg. Co., Chicago, Ill. Distributed by Royal Mfg. Co. of Duquesne, Duquesne, Pa. No U. S. patent or trademark.

Loveman's Tooth Paste.—Composition: See Sheffield Tooth Paste (A.D.R. 1939, page 114).

Manufactured by the Sheffield Company, New London, Conn. Distributed by Loveman, Joseph & Loeb, Birmingham, Ala. No U. S. patent or trademark.

Advance Tooth Powder.—Composition: Each hundred grams is stated to contain granulated Castile neutral soap, 8 gm.; precipitated calcium carbonate, medium heavy, Peerless, 92 gm.; soluble saccharin, 0.2 gm.; oil of peppermint, 0.4 cc.; oil of cinnamon, 0.2 cc.; methyl salicylate, 0.8 cc.

ABRASIVENESS: 4.6 mg. loss on Peerless Machine (details filed with Council).

Manufactured by Zeno Supreme Quality Products Laboratories, A Division of Coffee Products of America, Inc., Ltd., Los Angeles, Calif. No U. S. patent or trademark.

LOCAL ANESTHETICS†

Procaine Hydrochloride Solution 2% with Neo-Synephrin 1:2500-Rorer: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; neosynephrin hydrochloride (Stearns), 0.0004 gm.; sodium bisulfite, 0.0019 gm.; sodium chloride, 0.001 gm.; sodium citrate, 0.0009 gm.; chlorobutanol, derivative of chloroform, 0.005 gm., and redistilled water, q.s.

Manufactured by William H. Rorer, Incorporated, Philadelphia, Pa. U. S. Patent No. 1,680,055 on Neo-Synephrin held by Frederick Stearns & Company. U. S. trademark on word "Hypotube" No. 354,460.

Procaine Hydrochloride Solution 2% with Neo-Synephrin 1:2500-Rorer in Injection Cartridges (Hypotubes) approximately 2.5 cc.

Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information on the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. 1939, p. 108.
†A.D.R. 1939, p. 38.

President's Message

THE NEED OF AN INFORMED AND UNITED PROFESSION

NEW presidents, like new brooms, may not always sweep clean, no matter how good their intentions. In any event they can hardly hope to do so without the intelligent cooperation of the membership which they represent.

The dental profession is at present confronted with many serious problems and responsibilities, some of them new, and threatening its very existence. What it does in the present may determine the kind of profession it will be in the future—whether it shall continue as a health service profession or be broken up into separated and discordant units, educated on varying levels.

The most important factor in the solution of our problems, it seems to me, is an *informed and united profession.* I use both of these words advisedly. We need to know more about dentistry's social responsibilities and what we should do and are doing to meet them. We need to know more about the objectives and activities of the American Dental Association and what it is doing along many lines to promote the interests of the public and the dental profession. We need, also, a *deeper sense of our personal responsibility* toward our calling and our duty to it.

We need, too, a *united* profession. Every member, interested in its welfare, should join with his coworkers in making his influence effective not only in the interest of dentistry but in the interest of self. There is no better way in which to do this than by active membership in the American Dental Association. We can hardly hope to make our influence felt as individuals when acting independently.

In the effort that is being made to solve the problems with which we are faced, we need, and should have, the active and sympathetic support of *every practicing dentist.* We need, in a word, to know more about our profession, more about the effort it is making to meet these responsibilities and more about the ways in which *we, as individual members* of it, can be of service.

If this be so, it would seem to be my plain duty as the incoming president of the American Dental Association to do what I can to keep our members informed regarding the activities of the Association and to suggest ways and means by which they can be of assistance. This I hope to do by presenting from time to time brief and informative messages in THE JOURNAL, since it will not be possible for me to meet many of our members in any other way.

Arthur A. Merrill

ASSOCIATION ACTIVITIES

INSURANCE COMMITTEE

GOOD INTENTIONS OR REGRETS?

As two freshmen, roommates, in dental college were unpacking their trunks, one of the boys put a photograph on the dresser, a picture of a young man whose resemblance to the boy was remarkable. The other boy, noticing the resemblance, asked if it were an older brother.

"No," replied his roommate, "it is a picture of my father, taken just before he died. I was only a little boy then."

"He certainly must have been a fine fellow," commented the other.

"Yes, he was. I don't remember my dad, but I know him by what people have told me about him." And, in unfeigned reverence, he took the picture in his hands, and studying his father's youthful countenance, said seriously, "But Dad remembered me. When I was born, he took out an insurance policy which was for the express purpose of guaranteeing me a start in life—an education. He must have been very fond of me."

Certainly this father recognized, and arranged to meet, the obligation of giving his son a start in life, even though he might not live to see the time when the need for it would arise.

While this story may apply to only a small percentage of dental students, the point it brings out is that any young graduate who says he has no need for life insurance protection has completely overlooked the investment that his education represents. He has also overlooked the future obligations he must assume in order to buy equipment and live through the lean years during which he builds a practice, and the many other responsibilities that are assumed by the average professional man.

Recognizing the need of its members for low cost protection, and having the ability to provide this protection through a group insurance policy, the American Dental Association contracted for such a policy in 1929. Today, that policy has grown to the huge sum of nearly $20,000,000 of insurance in force. As a result of the foresight of the A.D.A. in providing the same benefits for new members as for those originally insured, every member under age 50 will be eligible from now on to apply for the coverage.

Each age group pays its own cost, and since there is no penalty to the younger man, as is the case with most group policies, the cost to those of ages 21 to 30 inclusive is only $3 per $1,000 semiannually. Every newly graduated member or junior member of the A.D.A. should exercise his privilege and carry this insurance in protection of his obligations both present and future. It will not only save him considerable money at a time when his need for low cost protection is greatest, but it also will guarantee to him the ability to secure an individual policy at age 51 if at that time he prefers some plan combining both investment and protection.

The A.D.A. has not only secured the largest and strongest company eligible to carry this type insurance for its members, but also has preserved for both present and future members a superior policy which would not otherwise be available to them.

Good intentions without action have changed the lives of many people in the past and will continue to do so in the future in spite of all the advice one could give. For example, let us illustrate with a brief story:

"Dad," said a 12-year-old boy, "don't you earn as much as Tom's dad does?"

"Yes, I think so. Why do you ask?"

"Well, I thought you did," replied the boy, "but I can't figure out why we must do without so many of the things that Tom's folks have. They go on long vacation trips and have a car. Tom gets to go to camp every summer. They have a maid, and just a lot of things we don't have."

"That, my son, is the big difference between having life insurance protection and not being able to get it because of poor physical condition. Both Tom's dad and I feel a great responsibility toward our families and want to provide for their education as well as for our own old age. Tom's dad was able to get life insurance when he assumed those responsibilities and is secure in the knowledge that his goal will be reached whether he lives too long or dies too soon. With me, it's a different proposition; one of hoping that I'll live long enough and be able to save enough to eventually enjoy a like feeling of security. Do you understand now, son?"

Don't allow your good intentions to become regrets. Act now!

Write today for additional information and for application blanks to

Fred A. Richmond,
Insurance Sec'y, A.D.A.,
Huron Bldg.,
Kansas City, Kan.

NATIONAL HEALTH PROGRAM COMMITTEE

FURTHER expansion of the Nation's present health program by an act of Congress is imminent. Both the American Medical and American Dental Associations have staunchly and repeatedly maintained that the "Wagner Health Bill" cannot be amended satisfactorily. It is more than likely that both organizations would have a similar opinion about the measure introduced by Senator Lodge, providing certain limited medical and hospital services to unemployed persons. It would logically follow that these two great professional organizations should concern themselves with the formulation of plans which could be transposed into legislative form as a substitute for these objectionable measures now proposed. This does not mean that the American Medical Association and the American Dental Association must necessarily order or supervise the drafting of suitable health legislation, but it does mean that they should be prepared to provide Congress with suitable memoranda for the writing of a satisfactory national health act, if and when Congress is ready to authorize the appropriation of sufficient funds to effectively carry out a national health program.

The House of Delegates of the American Dental Association has already expressed its approval of such a progressive and constructive course by adopting at its Milwaukee session the report of its National Health Program Committee.

REPORT OF COMMITTEE ON DENTAL LEGISLATION

To the Officers, Board of Trustees and the House of Delegates of the American Dental Association:

HEREWITH is submitted a report of the activities of the Committee on Legislation for the year 1938-1939.

In this past year, forty-four state legislatures have been in session. A great number of bills dealing with dental subjects have been introduced and, as a consequence, the committee has enjoyed a very active year. There has been a large amount of correspondence with state society officials, interested members, government officials, editors of lay and professional magazines and other persons seeking information on matters within the purview of the Committee on Legislation.

At the beginning of the fiscal year, the committee requested and was granted authority to add to its activities a legislative reporting service, to enable the Association and its Committee on Legislation to keep informed on the trend of state dental legislation and to assure to each component society prompt and complete information about every legislative proposal entered in their respective legislatures and affecting the practice of dentistry. The committee then proceeded, through the medium of this legislative service, to secure this information and notify all state societies directly concerned of bills entered in their legislature. A total of more than 460 bills were considered of sufficient importance in their relation to dental practice to warrant reporting to the respective state societies, by telegram or air mail as the importance of the bill might indicate.

This assistance rendered the component societies has been well received, particularly by the many societies which have no special provision for the reporting of legislation, and the committee has received many letters expressing appreciation for this service.

There may be something of a tendency to assume that the only state legislation which is of particular interest to dental societies is those proposals which would revise or amend the dental practice acts or those dealing with voluntary or compulsory health insurance proposals. Such legislation is undoubtedly of most general interest, but it is by no means the only type of legislation deserving the active support or calling for the opposition of the dental societies. The committee therefore has reported a number of bills, such as those dealing with workmen's compensation, with narcotics and with medical care for indigents, that may have an important effect on the practice of dentistry.

The various types of bills entered in the 1939 sessions and reported as more or less directly related to the practice of dentistry are listed in Table 1.

While a large number of bills were introduced this year in some of the state legislatures, a proportionately large number were not passed. California and New York, for example, with a total of eighty-one reported bills, enacted no more laws affecting dentistry than did several of the states in which a much smaller number were introduced.

A total of forty-two bills proposing amendments to dental laws now in effect were considered and fifteen states amended their dental practice acts during the 1939 session.

Most of the amendments to the dental practice acts were confined to a change in the citizenship requirements for licensure. Bills requiring all applicants for dental licenses to be citizens of the United States were introduced in fourteen states and passed in six states. Three states passed similar bills except that an appli-

cant is permitted to take the examination if he has his first papers.

Michigan was the only state in which an extensive revision of the dental law was made, although a number of states made changes in specific parts of the law, such as advertising provisions and grounds for revocation of license.

Maryland enacted an amendment which prohibits any dental laboratory, person, corporation, entity, partnership or group of persons from soliciting the general public or advertising to them by mail, card, newspaper, pamphlet, radio or otherwise the construction, production or repair of prosthetic dentures, bridges, plates or other appliances to be used or worn as substitutes for natural teeth, or the regulation of natural teeth. The amendment provides for violation thereof a fine of not less than $50 nor more than $300 or confinement in jail for not less than fifteen days.

TABLE 1.—BILLS RELATED TO DENTISTRY ENTERED IN 1939 SESSIONS

Dentistry	69	
Narcotics	50	
Medicine	44	
Compulsory health insurance	13	
Voluntary medical care corporation	18	
Voluntary non profit hospital association	41	
Group health and accident insurance	20	
Cooperatives (medical aspect)	15	
Workmen's compensation	38	
Medical care for indigents	14	
State health departments	14	
Food, drugs and cosmetics	17	
Other groups		
Pharmacy, naturopathy, etc.	32	
Taxes		
Sales, gross income, license, etc.	23	
Medical, dental and hospital liens	12	
Rules of evidence (privileged communications, etc.)	8	
Expert witnesses	5	
Statute of limitations (malpractice suits)	3	
Basic science laws	2	438
Miscellaneous health measures		26
Total reported		464

In Connecticut, a bill to license dental technicians was killed in the House. In Colorado, a bill was defeated that proposed the abolishment of all examining boards including the board of dental examiners, substituting therefor one board composed of lay members, which would prepare and conduct all licensing examinations in the various professions and assume all the duties of the present examining boards. This same legislative proposal is now in Congress as a provision of the so-called Griffenhagen plan to revamp the government of the District of Columbia. In Illinois, a bill revising the definition of dentistry was passed.

Compulsory health insurance bills were introduced in five states: California, New York, Massachusetts, Pennsylvania and Rhode Island. None of these bills was reported out of committee except one in California, which proposed a compulsory health insurance plan within the system of unemployment reserves. This bill was amended in a number of ways and was finally killed by a vote in the assembly.

Legislation dealing with voluntary medical and hospital insurance plans was widespread in the 1939 sessions; undoubtedly a manifestation of current widespread interest in attempts to reduce the cost of hospital and medical care.

The most common subject of the bills reported by the Legislative Committee to the state societies, aside from dental bills, were those dealing with narcotics. A number of states amended their laws to include more complete definitions of drugs such as marihuana and the barbiturates. Prescriptions were also more closely regulated.

In Congress, the chief concern of the Committee was the bill entered by Senator Wagner and known as the National Health Bill. While all reference to compulsory health insurance was omitted from this bill, it proposed a vast system of federal-state tax supported medical care administered by public health officials. No action was taken on

the bill because the committee did not present its recommendations before adjournment. S. 658, introduced by Senator Capper, was essentially the bill entered in the preceding session. It proposed an annual appropriation of $200,000,000 to induce the states to develop and maintain adequate systems of health insurance. No affirmative action was taken in respect to it. S. 2093 and S. 2140, introduced by Senator Bone, would permit deductions, for purposes of federal income tax, of amounts paid during the taxable year not in excess of $250, for medical, dental, nursing and hospital service. H. R. 4779, introduced by Representative Tenerowicz, would amend the federal income tax law to permit deductions up to $500 of amounts paid during the year to physicians and dentists and for funeral expenses. Neither of these bills was passed.

Of first importance to the dental profession is the outlawing of the mail order denture racket and the Committee has closely watched the case of the Post Office Department against S. B. Heininger. The opinion of the Court of Appeals of the District of Columbia upholding the Department's charge of fraud against Heininger was published in its entirety in the June issue of THE JOURNAL. The Post Office Department and the Federal Trade Commission are commended for vigorous prosecution of fraud and the protection of public welfare and health.

Several state supreme courts have in this past year upheld their respective state dental laws and abstracts of these opinions, with other legislative matter of general interest, have appeared in THE JOURNAL, forty columns in all in the past eight issues. For this cooperation, we thank the Editor and the publication committee.

The Committee on Legislation respectfully submits this report and requests permission to submit a supplemental report containing whatever recommendations it may deem advisable to the House of Delegates during the annual meeting at Milwaukee.

TABLE 2.—NUMBER OF BILLS AFFECTING DENTISTRY INTRODUCED AND REPORTED*

Alabama	3	Maryland	10	Oklahoma	7
Arizona	4	Massachusetts	15	Oregon	6
Arkansas	16	Michigan	14	Pennsylvania	14
California	50	Minnesota	7	Rhode Island	5
Colorado	6	Missouri	10	South Carolina	4
Connecticut	13	Montana	4	South Dakota	3
Delaware	9	Nebraska	5	Tennessee	9
Florida	15	Nevada	4	Texas	15
Georgia	11	New Hampshire	5	Utah	5
Idaho	1	New Jersey	10	Vermont	4
Illinois	19	New Mexico	7	Washington	17
Indiana	17	New York	31	West Virginia	9
Iowa	5	North Carolina	7	Wisconsin	22
Kansas	8	North Dakota	5	Wyoming	1
Maine	11	Ohio	7		

*The legislatures of Kentucky, Louisiana, Mississippi and Virginia were not in session.

A. B. PATTERSON, *Chairman*,
CHARLES D. COLE, *Vice-Chairman*,
C. J. BAUMANN,
W. N. HODGKIN,
HARRY ALLSHOUSE, JR.,
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C. O. FLAGSTAD,
R. C. HARKRADER,
J. D. HERTZ,
HARRY C. METZ,
A. F. WEEKS,
SAMUEL R. LEWIS, *Secretary*.

June 7, 1939.

1840 1940

Dental Centenary Celebration

SPONSORED BY

THE AMERICAN DENTAL ASSOCIATION

Baltimore **March 18-19-20, 1940**

The most important meeting in the history of Dentistry will mark the celebration of the centennial of our profession.

The various committees, representing all the professional interests and all the sections of the country, have been inspired by a great purpose: to commemorate the one hundred years of advancement which has made their profession equal to the highest hopes of its founders.

The program will afford a liberal dental education, crowded into three busy days and nights, with emphasis on dental history and science.

The Dental Centenary Committee

19A Medical Arts Building

BALTIMORE, MD.

THE MID-CONTINENT DENTAL CONGRESS

St. Louis, Missouri

October 23-24-25

THE St. Louis Dental Society, now in its eighty-third year, following the precedent established by other large societies in providing a major annual meeting for members of organized dentistry, will hold the first Mid-Continent Dental Congress at the Hotel Jefferson in St. Louis October 23-25. The central location of St. Louis and its excellent transportation facilities make it readily available to a large section of the dental profession. The Hotel Jefferson is an ideal location for a large convention and the entire activities will be confined to two floors. The date, October 23-25, falls in that period of fine weather for which St. Louis is noted. The Mid-Continent Dental Congress extends a cordial welcome to all members of organized dentistry. The following program will be presented:

"Weaving Diagnosis into Practice"..Howard R. Raper, D.D.S., Albuquerque, N. M.
Discussors.....Clarence O. Simpson, M.D., D.D.S., Lee Roy Main, D.D.S., St. Louis, Mo.
"Amalgam Fillings".....Warren Willman, D.D.S., M.D., Chicago, Ill.
"Light from Primitive Races on How This Generation Could Improve the Next".....Weston A. Price, D.D.S., M.S., Cleveland, Ohio
"Full Dentures (Upper, Neil; Lower, Fournet)".....Harold Lytton Harris, D.D.S., St. Paul, Minn.
"Pedodontia".....Walter C. McBride, D.D.S., Detroit, Mich.
"Story of the Discovery of Anesthesia".....Howard R. Raper, D.D.S., Albuquerque, N. M.
"Periodontology".....G. R. Lundquist, D.D.S., Chicago, Ill.
"Anesthesia".....Albert P. Williams, D.D.S., Louisville, Ky.
"Oral Surgery".....Earl C. Padgett, M.D., Kansas City, Mo.
"Exodontia".....E. C. Thompson, D.D.S., Urbana, Ill.
"Diseases of the Mouth".....Virgil Loeb, M.D., D.D.S., St. Louis, Mo.
"Solving the Community Dental Health Problem".....Allen O. Gruebbel, D.D.S., Jefferson City, Mo.
"Operative Dentistry".....Samuel Rabkin, Cincinnati, Ohio
"Histologic Picture of Osteomyelitis of the Jaws Following the Extraction of Teeth".....William H. Bauer, B.S., M.D., D.D.S., St. Louis, Mo.
"Comparative Roentgenographic and Histologic Study of Oral Lesions".....Hamilton B. G. Robinson, D.D.S., M.S., William E. Koch, Jr., D.D.S., St. Louis, Mo.
"Use of Sulfanilamide".....Paul O. Hageman, M.D., St. Louis, Mo., Ralph W. Edwards, D.D.S., Kansas City, Mo.
"Pedodontia".....John M. Clayton, D.D.S., Kansas City, Mo.
"Dental Problems in Endocrinology".....Henry H. Turner, M.D., Oklahoma City, Okla.

"Full Dentures (Simple, Practical Technic)" ..... Jesse V. Boswell, D.D.S., Springfield, Mo.

"Gnathostatic Measurements in Denture Prosthesis" ..... Thomas R. Moore, D.D.S., St. Louis, Mo.

"Practical Partial Denture Construction" . Leonard E. Carr, D.D.S., Kansas City, Mo.

"Filling Porcelains" ..... Irl C. Schoonover, D.D.S., Washington, D.C.

"Fixed Bridgework" ..... Max Kornfeld, D.D.S., St. Louis, Mo.

SPECIAL CLINICS

"Amalgam Fillings" ..... Warren Willman, D.D.S., M.D., Chicago, Ill.

"Denture Clinic (Upper, Neil; Lower, Fournet)" ..... Harold Lytton Harris, D.D.S., St. Paul, Minn.

"Pedodontia Clinic" ..... Walter C. McBride, D.D.S., Detroit, Mich., John M. Clayton, D.D.S., Kansas City, Mo.

GENERAL CLINICS

More than 100 clinicians will participate.

SCIENTIFIC EXHIBITS

More than 450 feet of scientific exhibits will be on display.

VISUAL EDUCATION PROGRAM

Motion Pictures

(Continuous during meeting)

"Balanced Articulation" (Color) ..... Roland D. Fisher, Glendale, Calif.

"Bridgework" (Color) ..... F. W. Hinds, Dallas, Texas

"Porcelain Jacket Crown" (Color) ..... Carlisle C. Bastian, New York City

"Electro-Surgery in Dentistry" ..... M. S. Strock, Boston, Mass., Lewis Fox, Norwalk, Conn.

"Removal of Mandibular Third Molar" (Sound on film) ..... George B. Winter, St. Louis, Mo.

"Treatment of Periodontal Disease" (Color) . . . Leslie J. Fitzsimmons, Newark, N. J.

"Space Maintainers (Children's Dentistry)" . . . Charles S. Adelstein, Cleveland, Ohio

"Importance of Details in Cementation of Extensive Fixed Bridgework Construction" ..... Herbert H. Kabnick, New York City

"Oral Surgery Technic" (Color) ..... Berto A. Olson, Hollywood, Calif., C. Fordyce Nelson, Hollywood, Calif.

RADIO PROGRAM

Station KMOX ..... Weston A. Price, D.D.S., M.S.

Station KXOK ..... Walter C. McBride, D.D.S.

Station KSD ..... Allen O. Gruebbel, D.D.S.

Station KWK ..... Earl C. Padgett, M.D.

Station WIL ..... Henry H. Turner, M.D.

Golf — Skeet — Trapshooting — Sunday, October 22

Hobby Exhibit — Scientific Exhibit Section.

For further information, communicate with the General Arrangements Committee,

Dr. I. B. Dunhaupt, *Chairman*,
5035 N. Broadway,
St. Louis, Mo.

REPORT OF THE RESEARCH COMMISSION AMERICAN DENTAL ASSOCIATION*

P. C. LOWERY, D.D.S., Detroit, Mich., Chairman of the Commission

To the Officers, Board of Trustees and House of Delegates of the American Dental Association:

At the annual meeting of the American Dental Association held in St. Louis, Missouri, October 24-28, 1938, an appropriation in the amount of $17,000.00 was given to the Research Commission to cover grants and administrative expenses for the fiscal year beginning July 1, 1938 and ending June 30, 1939.

The Research Commission allocated this fund as follows:

1. American Dental Association Research Fellowship at the National Bureau of Standards,	$14,500.00
2. Committee on Dental Caries,	1,000.00
3. Cushion Fund and Miscellaneous,	500.00
4. Executive Board,	500.00
5. Secretary's Office,	500.00
Total,	$17,000.00

The Chairman and Secretary of the Research Commission held two conferences during the fiscal year at Washington, D. C. The Executive Board held a meeting at Chicago during the Midwinter Meeting of the Chicago Dental Society, for the purpose of discussing the disposition of two papers submitted to the Commission for review by the Editor of THE JOURNAL. In March 1939 the Executive Board held a meeting in Washington during the Five State Post Graduate Clinic for the purpose of discussing matters pertaining to the report on H-C Alloy. The President of the corporation which makes this product was present and a complete transcript of the conversation with him was made a part of the official records of the Board meeting. In addition, the work for next year was planned.

The $1,000 which was allocated to the Advisory Committee on Research in Dental Caries has not been spent, since the final manuscript of the compilation is not ready for publication. Therefore, this $1,000 is being returned to the American Dental Association with the hope that it will be re-appropriated for the coming year, as we expect to begin publication of the book on or before September 1, 1939. Part of the $500 which was allocated to the Cushion Fund and Miscellaneous was used for the Executive Board meeting held in Washington in March 1939. This meeting was of tremendous importance to the work of the Commission. One of the most significant pieces of work done at this meeting was the hearing given to Colonel Wanvig of the Silver Alloy Corporation before publication of our report on H-C Non-Tarnishing Alloy. As stated above, a complete transcript of this hearing was incorporated in the minutes of our meeting.

COMPARATIVE FINANCIAL STATEMENT

The accompanying table shows the expenditures during the fiscal year 1938-1939.

At the Executive Board meeting held in Washington on March 7, 1939, the Secretary was authorized, by a formal motion, to "take such funds from unexpended balances to meet deficiencies in budget items." This has been done as can be seen from the above figures.

The Research Commission has used all but $1,021.12 of its last year's appropriation of $17,000.00; $1,000.00 of this amount being the unexpended allocation to the Advisory Committee on Research

*Fiscal year July 1, 1938 to June 30, 1939.

in Dental Caries. Although this committee has functioned actively throughout the year no expense has been turned in because we are not quite ready to publish the compilation. It is sincerely hoped that this $1,000.00 will be readily reissued to the Commission for publication purposes. Besides this amount $21.12 is being returned after all expenses for the Commission have been paid.

Your attention is called to the overdraft of $218.23 in the amount allocated to the Fellowship at the National Bureau of Standards. This overdraft is really due to unforeseen taxes, and the amount has been made up by transferring moneys from the Cushion Fund and the Secretary's Office to achieve a balance.

During the year, under the able editorship of Dr. Homer C. Brown, former Secretary of the Research Commission, a comprehensive bibliography of the research projects conducted under the auspices of the Research Commission was published in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. This bibliography is in fact a minute history of the Research Commission and will be of tremendous value to future historians and workers in the field of dental research.

The Chairman and Secretary have been in communication with Dr. Parran, Surgeon General of the United States Public Health Service and arrangements are being formulated for the establishment of a fellowship at the National Institute of Health, Washington, D. C. This fellowship will be similar in operation to our present Fellowship at the National Bureau of Standards. The research work to be done in this new fellowship will cover the biologic sciences.

	Allocation for 1938-1939	Disbursed June 30, 1939	
American Dental Association Research Fellowship at the National Bureau of Standards	$14,500.00		$218.23 (overdrawn)
Advisory Committee on Research in Dental Caries	1,000.00		$1,000.00 balance
Cushion Fund and Miscellaneous	500.00	283.49	$216.51 balance
Executive Board	500.00	500.00	
Secretary's Office	500.00	477.16	$ 22.84 balance
	$17,000.00	$15,978.88	

During the past few years much of the appropriation for the Fellowship at the National Bureau of Standards has been eaten up by taxes. During the past year approximately $700 of the appropriation was paid out in taxes, such as the Social Security Tax, Unemployment Tax, Workmen's Compensation, etc. The Executive Board of the Research Commission requests the officers and the members of the Board of Trustees of the American Dental Association to take cognizance of this fact and to realize that close to $1,000 of the amount appropriated for the Fellowship at the National Bureau of Standards is not going toward research, but is expended for taxes and other purposes. This is a situation over which we have no control, but, unless it is appreciated, our work may be forced to suffer owing to the lack of sufficient funds.

GRANT NO. 1—AMERICAN DENTAL ASSOCIATION RESEARCH FELLOWSHIP, NATIONAL BUREAU OF STANDARDS, WASHINGTON, D. C.

The Commission appreciates the approbation of the Association for this the major activity of the Commission. The Commission shall continue to conduct and maintain the work on the same high plane and with the same dignity with which it has always conducted it. The Research Commission is determined to continue to merit the commendation of the public, the dental profession and

the manufacturers of dental materials.

It is particularly pleasing at this time to announce the more general cooperation of the profession in our program. In fact, this statement can be amplified to include our foreign colleagues who seem to be insisting that the materials which they use comply with the Specifications of the American Dental Association. The Commission is very cognizant of this movement. It has received several requests from foreign concerns that their products be tested for compliance with the A.D.A. Specifications. The Commission, while it would like to so do, is not in a position to have such tests conducted at the National Bureau of Standards unless the materials in question are sold and used fairly extensively in this country. It is uniformly recommended that foreign concerns desiring to have their products tested for compliance with the specifications, consult commercial testing laboratories in this or other countries.

There have been no changes in the personnel of the A.D.A. Fellows nor in the Bureau Staff assigned to the dental materials investigations during the fiscal year.

To Dr. L. Pierce Anthony, Editor of THE JOURNAL, the Commission is especially indebted because of his friendly criticism of and constructive interest in the program. The Commission is at the present time considering the formulation of a cooperating committee which, with the cooperation of the Editor, would undertake the critical review of those papers on dental materials which are submitted for publication in THE JOURNAL. Last year the Editor submitted two such papers to the Commission for review. It is thought valuable suggestions were offered.

POLICY OF THE COMMISSION IN CONNECTION WITH THE USE OF TRADE BRAND NAMES IN REPORTS

The use of trade brand names in reports is a particular item which the Commission has carefully studied, with the result that the prevailing policy represents a gradual development based upon eleven years of experience. In a discussion of the use of trade names in reports it is well to discriminate among the kinds of reports which are presented under the auspices of the Commission. These may be divided into three categories: (1) preliminary reports which present test methods and data on restorative materials used extensively by the dentist and where quality standards seem necessary, (2) reports on materials in which manifest misrepresentations are suspected and (3) lists of certified products. The Commission at the present time permits the use of brand names in types 2 and 3, but does not permit the use of trade names in the preliminary reports. To explain the foundation of this procedure it is well to outline the methods by which the various types of reports are prepared and to set forth the primary purposes of each type of report.

PRELIMINARY REPORT

The following steps are taken in the development of a preliminary report: (1) Representative trade brands of the material to be investigated are purchased on the retail market. (2) Physical and chemical properties which have a dental significance are determined at the National Bureau of Standards. (3) Clinical opinions and data on the materials are obtained through the aid of cooperating committees of dentists. (4) The clinical and laboratory experiences are used as a basis for the formulation of a proposed specification for the type of material under investigation. (5) The specification is then submitted by the Director of the National Bureau of Standards to dental schools, manufacturers, government departments and other interested parties, for criticism and suggestions. (6) The Director, if satisfied that the report covers the needs of the Commission and is in proper form, forwards it to the Re-

search Commission, which, with the House of Delegates, considers the formal adoption of the specification. If adopted, it becomes an official A.D.A. Specification.

From this outline, it is evident that the purpose of a preliminary report is to show that test methods have been developed which can be used to evaluate the suitability of a dental material. When these test methods are arranged so as to define a satisfactory material and to eliminate unsatisfactory materials they are designated as a specification which can serve as a standard for the profession. The Commission believes it is unfair to print trade names when the manufacturers have not had an opportunity to study the specification and test methods or to change their products so that they will comply with the A.D.A. Specifications. The Commission has had sufficient experience to know that the use of names in an introductory report, before standards have been adopted, sometimes conveys misinformation because of the great variance encountered among batches of the materials tested. Only after the manufacturer has proved to the Research Commission that he can and is willing to maintain the standard uniformity of his output is the Commission willing to announce names as is done in the Lists of Certified Materials.

REPORTS ON MISREPRESENTED MATERIALS

When unusual or unique claims are given for a product the Commission has, as far as time and personnel limitations permit, investigated such products. Last year reports on model materials and on a supposedly non-tarnishing alloy were presented, with the trade names, and will protect the dentist, both financially and professionally.

LIST OF CERTIFIED MATERIALS

One year after a specification becomes an official A.D.A. Specification the Research Commission invites the manufacturer to certify formally to the Commission that the manufacturer's products comply with the specification. The following form is used for this purpose.

Date.....

Research Commission, American Dental Association,
108 South Building, National Bureau of Standards,
Washington, D. C.

Gentlemen:

We, the undersigned manufacturers, hereby certify that our dental..... .....(1) sold under the trade brand name of..... ..... will meet all requirements and tests as specified in the current American Dental Association Specification No..... (2) for .....

We desire to have it placed in the list of materials guaranteed by the manufacturers to meet the requirements established by the American Dental Association. We agree to keep this product up to the standard of the A.D.A. Specification during the period of this certification.

We submit the attached data as evidence that this material meets the requirements.

Signed: .....
Title .....
Company .....
Street .....
City..... State.....

(1)	(2) A.D.A. Specification Number
Amalgam	1
Inlay Casting Investment	2
Impression Compound	3
Inlay Wax	4
Inlay Casting Golds	5
Dental Mercury	6
Wrought Gold Wire	7
Cementing Medium	8

The manufacturer is also requested to furnish the following data at the time the certification is made so that the Commission will know that he is in a position

to certify his products in a responsible manner.

DATA REQUIRED WITH CERTIFICATION

1. Brand of material.
2. Serial or lot number.
3. Date of manufacture (year and month).
4. Physical properties obtained by standard test methods. The information given as to physical properties must include a brief description of the apparatus used in making each test, the data obtained, the name of the observer and the date. All test conditions must be so defined as to permit of duplication in other laboratories. In the event that tests are made outside the manufacturer's laboratory, the name and address of the testing laboratory must be given. Inasmuch as occasional tests outside a manufacturing plant do not guarantee uniform production control, some mention shall be made of the frequency and amplitude of outside tests.
5. The data covering every requirement of the specification.
6. Specimens of labels, guarantees and instructions for use furnished with the product.
7. Policy regarding certification. No manufacturers' certificates will be accepted by the Research Commission of the American Dental Association, until retail sample or samples of the materials under consideration are procured and tested by the Research Associates of the American Dental Association stationed at the National Bureau of Standards.
8. The enclosed requisition blank for the procurement of test samples, signed and submitted with certificate and accompanying data.

After a manufacturer has complied with all of these formalities and the Research Commission is satisfied that he is testing or is having a competent laboratory test his material, the Commission will have some dentist or research worker procure on the open market a representative retail sample of the certified material. In order to spare the Association the large sums involved in the outright purchase of these materials, they are procured by the authority of the manufacturer, who must sign this blank requisition form at the time he forwards his certification.

REQUISITION BLANK

We, the undersigned manufacturers, grant permission to the Research Commission of the American Dental Association or to the authorized agents of the Research Commission to procure retail samples of our certified products from reputable retail dental dealers. These samples are to be used in testing for compliance with the A.D.A. Specifications. There is to be no charge other than transportation for these materials. The A.D.A. will pay this charge. In the case of products containing noble metals the scrap metal is to be returned to the manufacturer. If any loss has occurred in testing, the American Dental Association will reimburse the manufacturer at the current market intrinsic value for the specific amount of noble metals which are not returned.

The following procurement form shall be used:

To any Retail Dealer in the U. S. A.:

Please supply.....
(agent of the Research Commission who must first identify himself as such).....
.....packages, dwts., ounces of
.....
manufactured by.....

This requisition blank when properly filled out, signed, and returned to the undersigned manufacturers will be accepted in full payment of the above materials.

Manufacturing Company.....
Signed by.....

The Secretary of the Commission usually asks some dentist to procure the material from his local supply depot. The dentist sends the sample so procured to the American Dental Association Research Fellowship at the National Bureau of Standards, where the A.D.A. Fellows, with the assistance of the Bureau Staff, determine whether the sample passes the specification requirements. If the material is found to comply, the manufacturer's certificate is accepted and the material is placed on the List of Certified Products. If the material fails to meet the specification tests it will not be placed on the list. Instead, the manufacturer will be requested by the Commission to cease and desist from claiming that his product will comply with the A.D.A. Specification or to change the product so that it will comply with the requirements. If the manufacturer refuses to accede to the Commission's request, the findings are presented to the Federal Trade Commission. It is a pleasure to note that this procedure has not been regularly necessary. In fact, only three such cases have been presented to the Trade Commission. All other instances were amicably adjusted.

The Lists of Certified Dental Materials which are developed according to the foregoing procedure are printed from time to time in the Association Activities section of the A.D.A. JOURNAL and, judging by the manufacturers' reaction, they are widely used by the profession as a guide in the purchase of dental materials.

From time to time the products on this list are tested and the necessary revisions are made. There are 191 brands on lists as of June 1.

This, the present policy, the Research Commission believes equitable to all parties participating in the program and to the public, which is the primary reason that the National Bureau of Standards and the Research Commission are conducting this work.

We are pleased to include the following technical report of our senior Research Associate at the National Bureau of Standards. This report includes work by Research Associates and Bureau Staff.

OUTLINE OF THE COOPERATIVE DENTAL RESEARCH BETWEEN THE NATIONAL BUREAU OF STANDARDS AND THE AMERICAN DENTAL ASSOCIATION, 1938-1939

The cooperative research work on dental materials for the fiscal year 1938-1939 includes: (1) denture base materials, (2) hydrocolloidal impression materials, (3) cooperative program with dentists (correspondence courses and the clinical testing of materials), (4) the testing of certified materials and (5) miscellaneous activities.

1. DENTURE BASE MATERIALS

A survey of seventeen brands of dental rubber was completed. Results of experiences gained in this survey were embodied in a specification. Three types of material are specified; i. e., base, all purpose and veneer. This specification has been submitted to interested parties for criticism and is now in the hands of the Research Commission for consideration.

The physical properties of methyl methacrylate resins, which have a dental significance, are being determined. These properties include determinations of stiffness, strength and deflection by means of cross bend tests, shrinkage, solubility, warpage, water absorption and hardness.

It has been reported that some dental laboratories have failed to comply with requests of dentist for certain resins or certain types of resins which they specified for dentures. In order to combat this practice a rapid qualitative test was designed to sort the commonly used denture resins into their respective classes. This test procedure is being reported at the 1939 annual meeting of the Association.

2. HYDROCOLLOIDAL IMPRESSION MATERIALS

An investigation of seven currently used hydrocolloidal impression materials and of one made in the laboratory according to a formula found in the literature was completed. Among the properties investigated were properties in compression and in tension, temperature of gel formation, water content and the accuracy with which the materials would reproduce dimensions. The data derived during this investigation were used in formulating a proposed specification, which, after being submitted to interested parties, was revised and has recently been presented to the Commission for its consideration.

The dentists who were conducting the practical experiments on silicate cements have reported their findings, which are now being tabulated for publication.

The cooperative work on hydrocolloidal impression materials was completed and has been incorporated in the final report.

4. TESTING OF CERTIFIED MATERIALS

Materials which were certified to the Research Commission by the manufacturers as complying with the A.D.A. Specifications were tested by the A.D.A. Research Associates. The results of this testing program during the fiscal year are tabulated herewith.

From this tabulation it will be noted that approximately 18 per cent of the certified materials did not comply with the specification. Last year the percentage of materials which failed to meet the requirements was about twenty. Most of these failures can be directly attributed to carelessness on the part of the manufacturer.

Material	Number Tested	Number Complying with Specification	Number Failing to Comply with Specification
Amalgam Alloy	8	6	2
Investment (Inlay)	1	1	
Impression Compound	9	8	1
Wax (Inlay)	1	1	
Casting Gold Alloys (Inlay)	17	13	4
Mercury	6	6	
Wrought Gold Wire	3	2	1
Zinc Phosphate Cements	12	9	3
Silicate Cements	7	6	1
Total	64	52	12

3. COOPERATIVE PROGRAM WITH DENTISTS

The cooperative investigation of H-C alloy by the Fellowship and a committee of dentists was completed. A report appears in the June issue of THE JOURNAL. H-C alloy was found to tarnish. It was in fact no more tarnish resistant than the ordinary high silver amalgam which complies with the specification. H-C alloy did not comply with the A.D.A. Specification, nor did it contain 1.5 chromium and tungsten as the manufacturer claimed. A slight trace of chromium was detected by special efforts, but no trace of tungsten could be detected by the most delicate tests known to the National Bureau of Standards.

5. MISCELLANEOUS ACTIVITIES

(a) Specification Revision. The first revision of the American Dental Association Specification No. 3 for Dental Impression Compound was completed. This was forwarded by the Director to schools, manufacturers, government departments, etc., for suggestions and criticisms and is

now before the Research Commission for its action.

(b) Base Metal Alloys. Chemical analysis of brillium, lunorium, niranium, ticonium and vitallium have been practically completed. Active work on the investigation of these alloys will be the major activity next year.

(c) Determination of Arsenic in Silicate Cements. A method for precisely determining the total arsenic content of dental cements was perfected.

(d) Review of Reports. Review and discussion of papers on dental materials and on advertising matter was carried out for officials of the Association.

(e) Exhibits. Exhibits were prepared or revised for the annual meeting of the Association and for the New York Greater Dentistry Meeting. An exhibit of fifteen lantern slides for use at component society meetings was prepared.

(f) Gypsum Model Materials. An investigation of gypsum materials used in preparation of indirect inlay dies was completed.

(g) Visitors. Among the 173 visitors who came to the laboratory during the year were representatives of the profession, dental schools and institutions and dental manufacturers. Visitors from England, France and Switzerland were especially interested in the program.

(h) Lectures Before Dental Groups. Reports of the work were presented before the following dental groups:

American Dental Association
American Academy of Restorative Dentistry
American Full Denture Society
National Society of Denture Prosthetists
Ohio State Dental Society
Chicago Dental Society
First District Dental Society (New York) Prosthetic Section
University of Maryland (Prosthetic Staff)
Five States Post Graduate Course
Seventh District Dental Society (New York)
University of Rochester (Dental Research Group)
Rochester Dental Dispensary (Staff)
North Carolina State Dental Society
Maryland State Dental Society
Greater New York Dental Meeting
Baltimore Dental Society
International Association for Dental Research

(i) Publications. The following reports on the work were published during the year:

1. Paffenbarger, G. C., and Beall, J. R.: An Investigation of Four Gypsum Materials Used to Prepare Indirect Inlay Models. J.A.D.A., 25:1146, July 1938.

2. Schoonover, I. C., and Sweeney, W. T.: Some Properties of Two Types of Resins Used For Dentures. J.A.D.A., 25:1487, September 1938.

3. Research Commission. List of Certified Products. J.A.D.A., 25: 1857, November 1938.

4. Research Commission. Annual Report. J.A.D.A., 26:127, January 1939.

5. Research Commission. List of Certified Impression Compounds. J.A.D.A., 26:285, February 1939.

6. Brown, H. C.: Bibliography. J.A.D.A., 26:651, April 1939.

7. Paffenbarger, G. C.: An Investigation of a Supposedly Non-Tarnishing Amalgam. J.A.D.A., 26:990, June 1939.

Reports in preparation include hydrocolloidal impression materials, a specification for denture rubber, physical properties of methyl methacrylate resins, revised specification for dental impression compounds and the cooperative work on silicate cement.

Respectfully submitted,

GEORGE C. PAFFENBARGER,
Research Associate.

BUREAU OF PUBLIC RELATIONS

CARLETON COLLEGE DENTAL HEALTH SERVICE

By WILLIAM A. GREY, D.D.S., St. Paul, Minn.

THE Carleton College Dental Health Service has been functioning since January 1931. Therefore, we feel that we have had an excellent opportunity to pass judgment on its value to the student.

The primary function of the dental service is to educate the students to an appreciation of the value of mouth care and its relation to general health. Existing defects are brought to the students' attention, and the importance of having them corrected is emphasized.

An effort will be made to answer the many requests for information from different parts of the country in regard to the amount of space necessary to carry out this work and also the cost of the work.

The office space includes a small reception room, an x-ray room with lead screen, a room for examinations, an adequate developing room, a room equipped for mounting, reading and filling and an office. Expenses would vary, depending on the number of students in the school where the work was carried on and also the thoroughness with which the work was done and records checked. The cost of this work in any school depends largely on the budget allowed for it. Even if the budget is small, however, thoroughness should be emphasized.

At the beginning of each school year, I give a lecture to the freshman class concerning the characteristics and value of mouth health as contrasted with the disease conditions so often found, placing special emphasis on the preventive rather than the curative measures.

The routine work of the service is carried out in the following manner: Students each year have two appointments. At the first appointment, a fourteen-film set of roentgenograms is taken, and, at the second appointment, a thorough examination is given, all cavities and conditions visible clinically being checked and recorded, and the defects shown by the roentgenograms noted. Also, a thorough check is kept on all work done, as any one is liable to make mistakes, but these mistakes can easily be corrected and thus the work be more beneficial to the student. The educational value of the work is always foremost.

Time is given to the individual student during the examination to explain the import of defects and any other existing conditions, not only from the standpoint of a healthy mouth, but also from the standpoint of general health; and to answer any questions the student may ask. The work of the dental service is entirely diagnostic and advisory. When the student leaves the office, he is reminded to call for his roentgenograms and take them to his dentist. No student is at any time referred to a dentist. X-ray films are returned to us each year when classes are resumed, and when the student graduates, he is entitled to the four sets of pictures and the accompanying diagnoses, provided the previous sets taken out have been returned to the dental health service.

There are seven dentists located at Northfield, and each man gives on an average of about one hour a week to this work, without remuneration. There is an understanding with each man that if anything is said which might influence the student to go to him for work, he will be dropped immediately from the service. The high standards of loyalty, good workmanship and cooperation of every man engaged in the work are noteworthy. In comparing the years 1934-1935 and 1938-1939, the drop in the number of cavities and abscessed teeth evident is remarkable. The number of devitalized teeth has increased, and this, it is believed, has been brought about when pulps have been exposed or almost exposed, and treatment has been recommended instead of extraction. In the accompanying table, comparison is made between the two years' work.

RECORDS FOR 1934-1935 AND 1938-1939

	1934-1935	1938-1939
Students examined:	682	863
Cavities found clinically:	1862	1082
Additional cavities found roentgenographically:	1033	1024
Average number of cavities per student:	4.2	2.4
Abscessed teeth:	33	15
Pulpless teeth:	97	117

In the examinations during the last two years, we have not looked so thoroughly as we could into the interproximal surfaces before looking at the x-ray films and consequently, as will be seen, about 50 per cent more cavities were found roentgenographically this year.

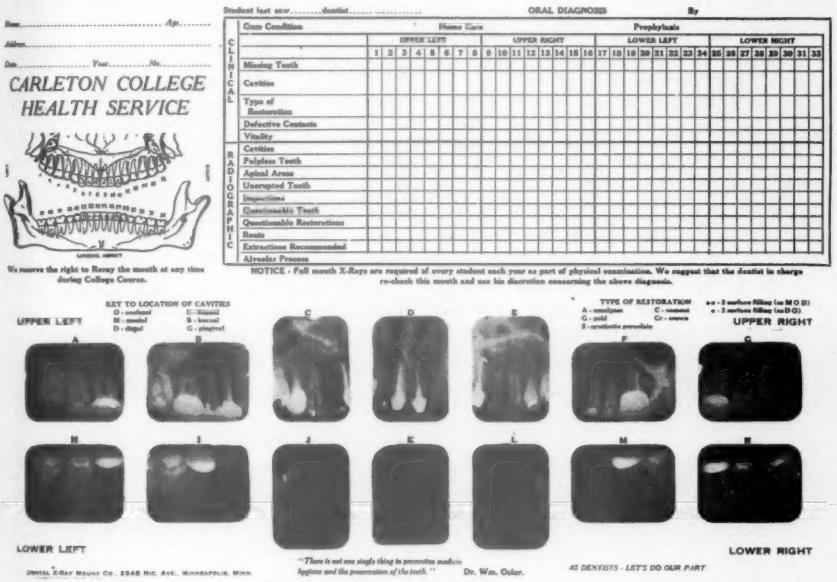
A pulpless tooth, according to our interpretation, is one the pulp of which has been removed and the root canal partially or entirely filled. Abscessed and pulpless teeth are considered potential foci of infection. Removal of definitely abscessed teeth is advised unless there is a possibility of restoring them to a completely healthy condition. Medical and dental service records are compared and, from the two, a final diagnosis is formulated as it relates to the general health of the student. Before extraction of teeth is advised, careful consideration is given to the student's general health and also to the preservation of the dental arch from the standpoint of function and esthetics. We realize that if the importance of the preservation of teeth and the maintenance of a healthy mouth had been emphasized earlier in life, and the mouth checked periodically, a large percentage of the missing teeth might have been saved. This, we believe, is plainly shown by the accompanying table. Our students come from a large area, being scattered throughout the United States, but, year after year, they come from much the same localities. Consequently, the dentists in these localities, knowing the mouths are to be carefully checked at Carleton College each year, take more pride in the mouths of these students, and the students also are taking better care of their mouths. Therefore, as they return to us, we are finding fewer and fewer cavities on clinical examination and also fewer with the assistance of the x-rays.

By impacted teeth, we mean those with no chance of eruption. In accordance with our judgment, these teeth, owing to their malposition, can never assume their proper functional relationship with the other teeth in the arch, and their presence is likely to cause neuralgia, inflammatory conditions of the surrounding tissues extending back into the throat region, injuries to the adjacent teeth, etc. We have advised the removal of almost all of this group, since it is believed that many of these conditions can be avoided by early detection and removal of im-

pacted teeth. During the first few years of the work, an effort was made at saving a number of the definitely impacted lower third molars to see what might happen regarding these teeth during the four years that the student was in college. After a thorough trial, we were, we found, making a mistake, as only a small percentage of the teeth changed their positions at all and a large number gave trouble. We are now advising extraction of all of the definitely impacted teeth. We also know that the younger the by orthodontic measures. Some of these conditions are being corrected now as a result of our educational work.

The main concern throughout our work is to gain the interest and cooperation of the student. We feel that today we have the complete cooperation and appreciation of the student body. These conclusions are drawn from the amount of recommended work done for the students between yearly examinations.

For the past seven years, the mouths of all Carleton College employes engaged



Carleton College dental staff full-mouth roentgenograms. The student takes the films, with diagnosis, to his dentist.

student when these teeth are removed, the simpler the operation. Therefore, we render the best service by recommending the removal of all definitely impacted teeth. Some teeth we have called impacted probably should have been called unerupted; but this number is very small. We mean the cuspids and bicuspids, which should, in the majority of cases, be brought into normal position in the arch in the handling of food have been examined yearly in exactly the same way that the students' mouths are examined. That is, a full mouth x-ray and thorough clinical examination. The requirement is that employes must have clean healthy mouths if they wish to stay in the employment of the college.

Members of the faculty and administration are entitled to this service, and

a number of them come in each year.

During the years that this work has been carried on, lantern slides have been made of cases that are outstanding from a dental educational angle. A number of these have been used in the freshman lectures and lectures at other colleges, and to present the Carleton College dental service at dental society meetings.

The work has been shown under the head of a health exhibit at the American Dental Association convention, St. Paul, August 1934, and at all Minnesota state meetings since that time except last year, when we were asked to exhibit but were unable to do so. The service was also demonstrated at the Chicago Dental Society meeting several years ago.

After eight years of work, we feel, as we did four years ago, that the educational work has been far more beneficial to the student body than if we had also attempted to carry out restorative work. It is still our judgment that if restorative work has been done in an institution, individual educational work has been neglected. We are sure that this work has stimulated those dentists who have come in contact with the students' reports or have become informed as to our work to greater efficiency and a higher standard of dental service.

Always uppermost in our minds are the benefits to be derived by the students through the dental service, from the educational work and from bringing to their attention the work necessary. In our judgment, the dentist and the student derive equal benefit from this work; the former through the stimulus that he receives for more efficiency in his own office.

One of the most gratifying things in our nine years of work is the increased interest and appreciation shown by the entire student body and faculty. We are hoping that, in the year to come, we will have the opportunity of giving regular periods of instruction to all freshman students and others whom it would benefit, in the care of the mouth. This has been carried out this year with a number of students, but not so many as we would like to reach through the coming year. During the past year, the dental hygienist, Miss Winifred Haglund, has given a number of students individual and thorough instruction in the everyday care of the mouth. During the year 1939-1940, much more time will be set aside for this work.

After x-raying and examining the mouths of about 7,000 students, we have data that can be depended on as to the value of x-rays in examination of the mouths of young persons of college age. After examination of these students, each operator carrying out the work as thoroughly as possible from the standpoint of clinical diagnosis, followed by the x-ray diagnosis, the records show that about 50 per cent more cavities have been found with the assistance of the x-rays. Since cavities, periodontal conditions, devitalized, abscessed and impacted teeth and defective fillings are found which would otherwise probably have been missed, we cannot emphasize too strongly the value of full-mouth x-ray examinations for young persons of college age.

We predict that, in the near future, this work will be started with young people of high school age, instead of waiting until college age, when so much damage has been done.

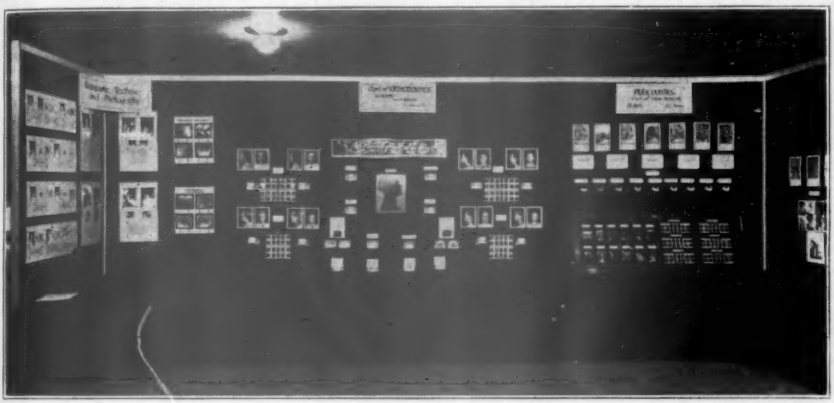
Charles E. Lyght and Caroline Helmick and their associates, of the Carleton College Health Service, have cooperated wholeheartedly with the dental service.

Carleton College and the entire dental staff appreciate also the cooperation (which is increasing every year) of the dentists throughout the country who have rendered dental service to students of Carleton College.

SCIENTIFIC AND HEALTH EXHIBITS AT MILWAUKEE MEETING

THE array of scientific and health exhibits at the Milwaukee meeting amazed and delighted every member and guest who visited the Municipal Auditorium. The facilities of Mechanic's Hall were excellent for this type of display and the eighty exhibits filled the entire space, with no overcrowding. The wide aisles and ample overhead lighting enabled each exhibitor to present his material to the best advantage and allowed visitors to study the material with no crowding or confusion.

The hearty cooperation of the exhibitors permitted the committee to present several displays covering almost every phase of dentistry. The quality of the exhibits was much improved over that of previous years. There is no doubt that the policy established by the Board



Section of Marquette University exhibit at A.D.A. Milwaukee meeting dealing with roentgenography, orthodontics and periodontia.

Section of Marquette University exhibit at A.D.A. Milwaukee meeting showing material on root canal therapy and operative dentistry.

of Trustees of giving certificates of award to the exhibitors presenting the best display has much to do with the improvement.

The New York Institute of Clinical Oral Pathology won first award for Class A exhibits dealing with original research. Class B honors went to Marquette University, of Milwaukee. Samuel Rabkin, of Cincinnati, won first award in Class C. Two sections of Marquette University's 185-foot exhibit are shown in the accompanying illustrations.

DENTAL EXHIBIT IN MEDICAL LIBRARY, ST. LUKE'S HOSPITAL, NEW YORK CITY

MEMBERS of the medical and nursing staff of St. Luke's Hospital, New York City, were recently given the opportunity of studying a very excellent dental exhibit prepared by the hospital's efficient librarian, Miss Hildegarde Lemcke, assisted by members of St. Luke's dental staff.

The well-rounded exhibit dealt with prosthodontia, periodontia, infections of the mouth and diet. It consisted largely of well-arranged photographs of the mouth, supplemented by charts, graphs and other illustrations. The accompanying illustration and outline give a comprehensive idea of the completeness of the exhibit. Members of other hospital dental staffs might well copy the idea.

OUTLINE OF THE DENTAL EXHIBIT IN THE MEDICAL LIBRARY, ST. LUKE'S HOSPITAL

1. The teeth (colored charts):
(a) Healthy and diseased teeth.
(b) The functions of the various teeth.
(c) The formation of the two sets of teeth in the jaws.
(d) Periods of eruption and of calcification of the teeth.

2. Vitamins and the teeth:
(a) Foods that make for development and preservation of teeth.
(b) Calculated vitamin chart for teeth development.
(c) Medicines that are of value for the teeth.

3. Oral hygiene education:
(a) Colored posters showing necessity for sleep, rest, food, etc. (These posters are intended for the use of children.)
(b) Material available for education from the A.D.A.

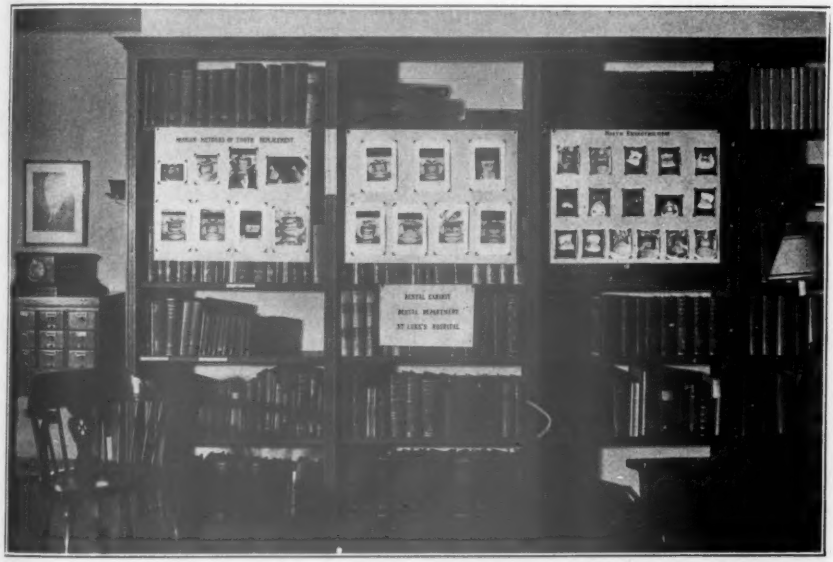
4. Pictures:
(a) St. Apollonia.
(b) The surgeon dentist.
(c) Wilhelm Konrad von Roentgen (1845-1923).
(d) First public demonstration of anesthesia.

5. Oral surgery:
(a) Infections of the teeth and the oral cavities.
(1) Sarcomatous epulis, before and after treatment
(2) Carcinoma of the cheek
(3) Impacted cuspids
(4) Fused second and third molars
(5) Metallic poisonings — industrial and therapeutic
(6) Cleft of soft palate
(7) Tertiary syphilis
(8) Fractures and removal
(9) Cysts
(10) Salivary calculus
(b) Fracture of mandible.

6. Restorations:
(a) Unilateral replacements.
(1) Porcelain jacket crowns
(2) Anterior fixed bridges
(3) Posterior fixed bridges
(4) Posterior removable bridges
(b) Bilateral replacements.
(1) Bilateral replacements using clasps
(2) Bilateral replacements using internal attachments
(3) Combination upper and lower bilateral replacements

(c) Mouth reconstructions.
(d) Upper and lower denture.
(1) Full upper dentures completed before upper teeth are extracted and inserted immediately upon extraction of teeth
(2) Full upper immediate dentures with a lower lingual bar—upper dentures inserted immediately on extraction of teeth
(3) Full upper dentures with lower lingual bar
(4) Full upper and lower dentures
7. Pathology:
(a) Infections and treatment.
(1) Acute Vincent's infection
(2) Chronic Vincent's infection
(3) Ulcer with Vincent's infection
(4) Catarrhal stomatitis
(5) Antiseptic solutions
(6) Mouthwashes
(7) Acute infections; hot water irrigation
(b) Pocket treatment.
(1) Gingivitis from poor mouth care
(2) Gingivitis from avitaminosis
(3) Traumatogenic gingivitis
(4) Gingivitis complicated by non-detergent acid-producing diet
(5) Solutions: tannic acid, hypertonic salt solution, McCall's sodium sulfide solution, periodontal varnish
(c) Drug damage.
(1) Injury from too free use of sodium perborate
(2) Dentifrices that are harmful
(3) Excessive amounts of arsenical preparations
(4) Improper use of silver nitrate
(5) Intravenous injections of bismuth
(6) Injurious use of chemical acids
(d) Dentifrices.
(1) Recipes, salt and lime, liquid soap dentifrices, remineralizing dentifrice (Andresen)
(2) Gingivitis caused by the use of harmful dentifrices; from acid diet; from lack of oral care, and from toothbrush abrasion

Bibliography on dentistry; books; literature for distribution from public welfare agencies, the American Dental Association and various pharmaceutic houses.



Dental exhibit, St. Luke's Hospital, New York City.

DENTAL EXHIBIT AT THE NEW YORK WORLD'S FAIR

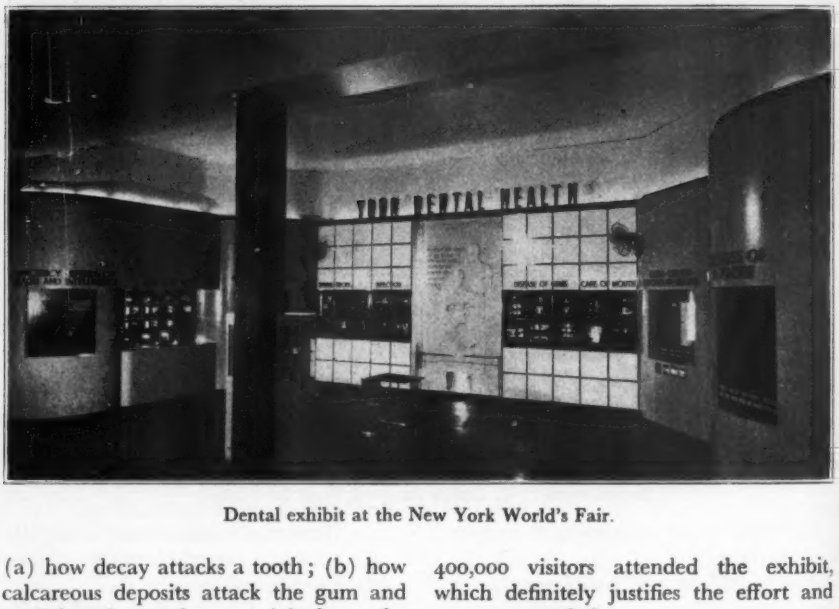
THE dental exhibit at the New York World's Fair occupies approximately 800 square feet of space in the Medical and Public Health Building. Its general theme is "The health and beauty of the world of tomorrow depend on the dental care of the world of today." This is depicted by means of a large hand carved center panel showing a father, mother and child.

Four electrically motivated units demonstrate four major dental problems: (a) how decay attacks a tooth; (b) how calcareous deposits attack the gum and periodontal membrane; (c) how the loss of one tooth weakens the dental arch, and (d) how defective teeth affect the appearance and reduce efficiency. An ingenious mystifying lighting effect adds to the effectiveness of each of these units.

Four series of hand-painted translights mounted in the back and side walls supplement the subjects covered by the large units. The translights graphically portray (a) the progress of dental decay, (b) how teeth grow, (c) infection of the mouth, (d) diseases of the gums, (e) care of the mouth and (f) replacement of lost teeth.

A semicircular showcase in the foreground displays specimens of inlays and partial dentures, models showing the development of teeth and an orthodontic exhibit.

A question box and registration book for visitors complete the display. Between June 1 and September 1, more than 400,000 visitors attended the exhibit, which definitely justifies the effort and money expended.



Dental exhibit at the New York World's Fair.

The exhibit is under the sponsorship of the American Dental Association and under the financial sponsorship of the Dental Society of the State of New York.

Contributions from the majority of the state dental societies east of the Mississippi River, the American Dental Association, dental manufacturers and dealers and individual dentists have made this excellent exhibit possible.

DENTAL ECONOMICS

VARIABILITY OF ROUTINE DIAGNOSES OF DENTAL DEFECT IN CHILDREN OF SCHOOL AGE*

By Charles F. Deatherage, D.D.S.; Lawrence A. Wilson, and Richard Ledgerwood, Ph.D., Springfield, Ill.

INTRODUCTION

SIXTY-THREE children in a large urban Illinois orphanage were examined independently by five staff dentists in the Division of Dental Health Education of the Illinois Department of Public Health. The data secured have been used to estimate the normal variability to be expected in the routine diagnosis of dental health in children of school age. Statistical methods are presented for evaluating the reliability of dental diagnosis.

In interpreting findings of the present character, it is important to bear in mind the special circumstances under which observations are made. The examinations differ radically in both objectives and means from those made in a private dental office.

Only the simplest portable equipment is available; namely, a mouth mirror, an explorer and perhaps a pocket flashlight. The examinations are conducted "in the field," the school nurse's office or a well-lighted classroom being set aside for the purpose. The examiner is dependent on ordinary daylight, the subject usually being placed near a window. In the winter months or on dark days, the lighting may be insufficient and unreliable, but may be supplemented by the use of a pocket flashlight. Ordinary ceiling illumination is usually not of much assistance.

The examiner must be cautious in employing the explorer lest accidentally a toothache be set up, since he is precluded by the terms of his assignment from providing even the simplest medication or altering the conditions found in any manner. The use of the x-rays to substantiate a doubtful diagnosis or verify a merely suspected condition is of course out of the question. Furthermore, the time allotted to an examination is strictly limited. From five to seven minutes is allowed for the examination of each subject whenever possible, but expenditure of even this much time may not be feasible when, because of the demands made on a limited staff, a large number of children must be examined in a single day. In Illinois, complete dental examinations are being made by six staff dentists on approximately 50,000 school and preschool children each year. The present series of examinations was made in the course of one afternoon.

The diagnosis of the condition of a single tooth is not in itself of crucial importance since no recommendation of specific operative procedure is to be made, but it is of indirect importance in the present context to the extent that it contributes to an estimate of the condition of a subject's mouth as a whole. The task of the examiner is to render such a quantitative estimate by piecemeal examination as a basis for recommendation to the parent of dietary changes, more adequate oral hygiene or corrective dental service. A report is made to the school, and comparisons of one school with another and of one community with another and with state averages are

*Dr. Deatherage, chief of the Division of Dental Health Education, Illinois Department of Public Health, superintended the collection of data; Mr. Wilson, statistician of the Illinois Department of Public Health, directed the analyses, and Dr. Ledgerwood, research analyst, composed the report.

emphasized in enlisting the interest and support of parent-teacher associations, local dentists and various civic organizations in the improvement of the dental health conditions of a community. Specific training for the task in hand is gained on the job, the amount and quality of attention given to the technic of examination being largely at the discretion of the head examiner, who usually has a heavy quota of routine examinations to handle himself.

In the present case, the examining dentist indicated on a chart for each child as he went along the condition found in each tooth position. A numeral code is provided for indicating three degrees of cavitation, fillings, extractions and retained roots. The following explanations were provided:

First degree cavity. If the explorer catches in a small external opening in the enamel or if it sinks beneath surface of the enamel but does not enter the dentin, the cavity is classed as degree 1.

Second degree cavity. If the explorer enters the soft dentin, or if the dentin is exposed, the cavity is classed as degree 2.

Third degree cavity. If the tooth is badly broken down or the pulp exposed, the cavity is classed as degree 3.

Filled. If a tooth has been restored by a dentist, mark filled.

Extraction. Distinguish from normal exfoliation.

Retained root. Indicate any segment of the tooth left in the gums.

For the purposes of the present analysis, the three degrees of cavitation, extraction and retained root have been grouped together as diagnoses of caries, since they have a common bearing as far as an estimate of the total dental defect at the time of examination is concerned. (Extractions were reported in twelve cases out of sixty-three; retained roots in seven.)

A serious effort was made to keep the present study on a basis in all respects as representative as possible of routinely scheduled examinations, with the sole

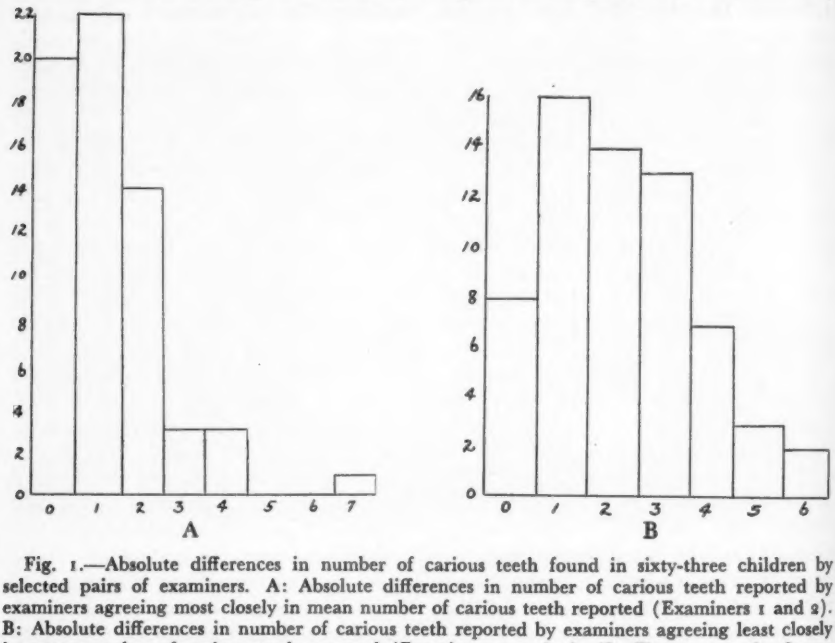


Fig. 1.—Absolute differences in number of carious teeth found in sixty-three children by selected pairs of examiners. A: Absolute differences in number of carious teeth reported by examiners agreeing most closely in mean number of carious teeth reported (Examiners 1 and 2). B: Absolute differences in number of carious teeth reported by examiners agreeing least closely in mean number of carious teeth reported (Examiners 3 and 4). (In Figures 1-3, the figures to the left of the diagrams indicate frequency.)

exception of multiple diagnosis. With respect to the subjects themselves, it is believed that the greater uniformity of impact of an institutional regimen of diet and other living conditions, including specific dental hygiene, may be responsible for a somewhat slighter variability of the diagnostic material than is usually found in a school population of similar age composition.

The sixty-three subjects examined consisted of thirty-seven boys of a mean age of 10.8 years and twenty-six girls of a mean age of 11.4 years. The age range

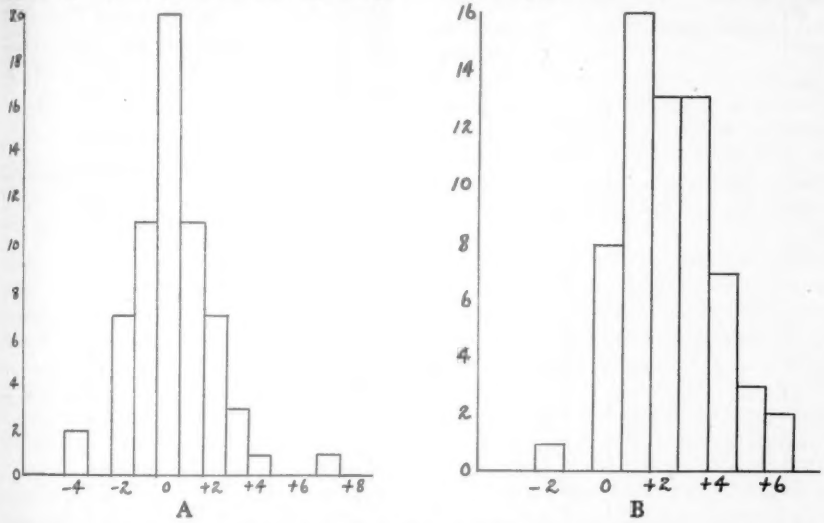


Fig. 2.—Signed differences in number of carious teeth found in sixty-three children by selected pairs of examiners. A: Signed differences in number of carious teeth reported by examiners agreeing most closely in mean number of carious teeth reported. The figures below indicate the number of carious teeth found by Examiner 1 subtracted from the number of carious teeth found by Examiner 2. B: Signed differences in number of carious teeth reported by examiners agreeing least closely in mean number of carious teeth reported. The figures below indicate the number of carious teeth found by Examiner 3 subtracted from the number of carious teeth found by Examiner 4.

of the boys is from 5 to 15 years; of the girls, from 6 to 14 years.

Broadly speaking, there are two fundamental questions at issue:

1. If an *individual* is examined by several presumably equally competent dentists, how closely can we expect the diagnoses to agree?

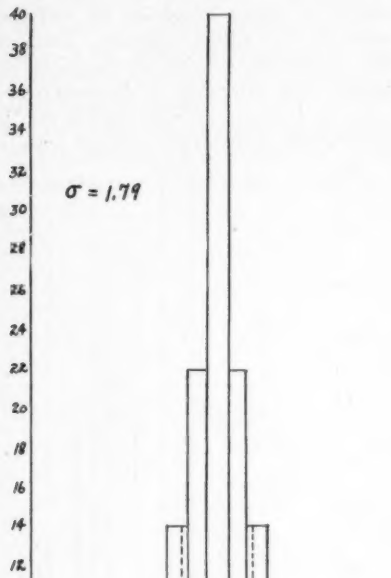
2. If two *groups* of persons are examined by different dentists and a difference in number of carious teeth is observed, what statements are we justified in making about the true relative dental condition of the two groups?

Provided with the appropriate information, we should be in a position to stipulate the number of examinations, either by the same or by different dentists, necessary to secure diagnoses of sufficient accuracy for stated purposes. Data on the variability of dental diagnoses obtained with reference to diagnostic procedures followed should enable us, by eliminating prevailing sources of error, to improve and standardize procedure to a point at which a single examination would suffice. There is an eventual prospect of developing a simple practical test of diagnostic skill which will make possible the specific selection of practitioners for tasks of the character in question.

In the comparison of age, sex, residence or any other groups whatever, it is essential to know the margin of diag-

nostic variation in order to determine the magnitude of reported differences which may be regarded as significant of anything more than discrepant diagnosis. This is true even in the case in which a single examiner is responsible for the whole set of data. His "error" may be presumed to be variable,* but is to be distinguished from the intrinsic variability of the case material. The problem which arises when the data compared originate with several examiners is admittedly more acute. The present report contains substantial evidence of constant differences between examiners, one examiner's report consistently understating or overstating the dental morbidity as compared with a colleague's estimates.

The task of diagnosis differs when, on the one hand, the recommendation of specific care in the individual case is at issue and, on the other, a relatively rapid mass survey of dental health is undertaken with a view to instituting more general measures. In the latter case, diagnostic reliability becomes extremely important in evaluating the effectiveness of clinical service and other factors in the dental health of a community.



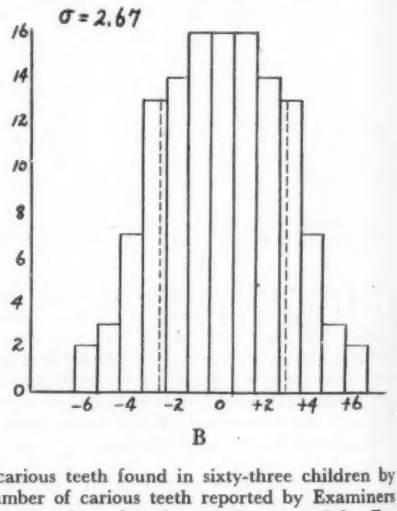


Fig. 3.—Reciprocal differences in number of carious teeth found in sixty-three children by selected pairs of examiners. A: Difference in number of carious teeth reported by Examiners 1 and 2; reciprocally computed. B: Difference in number of carious teeth reported by Examiners 3 and 4; reciprocally computed.

ABSOLUTE DIFFERENCES

Before discussing the detailed statistical treatment of the data, it will be helpful to consider the variation found in the table presented as an appendix to this study. Referring to the first child examined, we note that the examiners reported ten, thirteen, twelve, fourteen and twelve carious teeth, respectively. Two of the examiners agree in number of

*A later study will report on the validity of this assumption.

carious teeth reported. The greatest difference between any two diagnoses is 4.

Figure 1 shows the frequency distribution of absolute differences in number of carious teeth reported, Figure 1A comparing Examiners 1 and 2, and Figure 1B comparing Examiners 3 and 4. These comparisons were selected for illustration as exhibiting the extremes in agreement and disagreement found in the present study. With respect to mean number of carious teeth reported, Examiners 1 and 2 are in closer agreement than any other pair of examiners. Examiners 3 and 4 represent the greatest disagreement found. We observe that, in number of carious teeth reported, Examiners 1 and 2 agreed exactly in twenty cases out of sixty-three; whereas Examiners 3 and 4 agreed exactly in only eight. The maximum difference between Examiners 1 and 2 was seven carious teeth, in one case; the next most serious discrepancy between Examiners 1 and 2 being four carious teeth, in three cases. The maximum difference between Examiners 3 and 4 was six carious teeth. The distributions resemble minor truncations of a normal frequency surface, the second being definitely more flat-topped. The distribution of absolute differences between Examiners 1 and 2 strongly recalls the J-shaped curves found by F. H. Allport and others to characterize conforming behavior of various kinds. Figure 1B may be regarded as giving evidence of the same "pressures" in less degree, the truncation being more severe in Figure 1A and the relative peakedness of the distribution contributing to the same effect.

SIGNED DIFFERENCES

These distributions will be considered in greater detail later, but it is interesting to note now that, in reporting number of carious teeth, the absolute difference between Examiners 1 and 2 is 1.24 teeth per child and that between Examiners 3 and 4 is 2.19 teeth per child. These distributions yield some information bearing on our first question; namely, that concerning variation in the diagnosis of individual cases, but can tell us little concerning group comparisons. Two dentists may differ on the average by one tooth per child in reporting carious teeth and yet, in examining a group, the differences may be cancelled, one examiner being sometimes higher, sometimes lower than the other, with the result that the two examiners may find the same average number of carious teeth in the group.

We shall consider, then, for the same two pairs of examiners as before, the distribution of signed differences. In Figure 2, the number of carious teeth reported by the first examiner mentioned is subtracted from the number reported by the second examiner. Subtracting in the opposite direction would result merely in reversing the signs of the differences found.

It is at once evident that the differences between Examiners 1 and 2 are symmetric about the origin and are very nearly cancelled; whereas the differences between Examiners 3 and 4 are, with one exception, of like sense. The mean difference between Examiners 1 and 2 is only 0.19 teeth. That between Examiners 3 and 4 is 2.13 teeth. These facts throw some light on our second question. We certainly should not, without due correction, wish to compare the dental health of one group examined by Dentist 3 with another group examined by Dentist 4.

It should be emphasized here that the present study must be regarded as a preliminary, exploratory investigation designed for the purpose of working out a suitable statistical methodology. The concrete factual data adduced are not of primary importance and must, pending confirmation, be regarded merely as illustrative of the analytic procedures employed. Among the factors in concrete differences of the size noted may be the circumstance that reports were made on a form which had been in

use by the cooperating examiners only a few weeks.

I. ANALYSIS OF DIFFERENCES IN THE DIAGNOSIS OF INDIVIDUAL CASES

We shall consider first the distribution of absolute differences between pairs of examiners, as in Figure 1. Besides the means, we shall want the standard deviations of the distributions and the standard errors of the means. Among five examiners, there are $\frac{n(n-1)}{2}$ or ten possible pairs. The constants just mentioned

TABLE 1.—STATISTICAL CONSTANTS RELATING TO ABSOLUTE DIFFERENCES IN NUMBER OF CARIOUS TEETH REPORTED BY ALL POSSIBLE PAIRS OF EXAMINERS

Examiners	M_Δ	σ_Δ	σ_{M_Δ}
2 and 3	1.1429	1.1480	0.1446
1 and 6	1.2222	1.1280	0.1421
1 and 2	1.2381	1.3040	0.1643
2 and 6	1.2857	1.2238	0.1542
1 and 3	1.4286	1.2790	0.1611
4 and 6	1.4444	1.1747	0.1480
2 and 4	1.5556	1.1469	0.1448
1 and 4	1.6190	1.2754	0.1607
3 and 6	1.7302	1.5781	0.1988
3 and 4	2.1905	1.5330	0.1931

$$M_\Delta = \frac{\Sigma\Delta}{N} \quad \sigma_\Delta = \sqrt{\frac{\Sigma(\Delta - M_\Delta)^2}{N-1}}$$

$$\sigma_{M_\Delta} = \frac{\sigma_\Delta}{\sqrt{N}} \quad N = 63.$$

are presented for all ten pairs in Table 1, arranged in order of the mean absolute differences. An absolute difference is symbolized by Δ.

Let us examine these results for Examiners 3 and 4. Examiners 3 and 4 differed on the average about $2\frac{1}{5}$ teeth in the number of carious teeth they reported ($M_\Delta = 2.19$). How reliable is this average difference? Our sample contained only sixty-three cases. If the dentists concerned had examined many more children, could not the average difference have been much less? The standard error of the mean $\left(\sigma_{M_\Delta}\right)$ enables us to answer this question. It is a measure of how much a mean may be expected to vary from sample to sample; and it grows smaller as the sample grows larger, varying inversely with the square root of the size of the sample. The chances are about 2 in 100 that the true mean is less than $M_\Delta - 2\sigma_{M_\Delta} = 2.1905 - 2(0.1931) = 1.80$ teeth.

One can find the mean of the absolute differences between all the dentists, but working with absolute values offers difficulties in practice, and an interesting statistic was developed that is easier to calculate, especially with the aid of machines, and that summarizes most of the information desired in one constant.

If, in a series of determinations of an attribute, such as the number of carious teeth in a mouth, we subtract each observation of the individual case from every other observation of the same case, we get a distribution of differences which is strictly symmetric about a mean of zero. Half of the differences will be positive and half negative. The situation is unaltered if we obtain the distribution of differences from the observations of sixty-three children, instead of one only, by five examiners (multiple determination of each case). The standard deviation of such a distribution establishes the limits on each side of the mean within which approximately two-thirds of the differences lie. Suppose that we disregard the signs of these differences, combining the frequency of a difference of -1 with that of $+1$, the frequency with which a difference of -2 occurs with the frequency of occurrence of $+2$, and so on: approximately two-thirds of the differences in diagnosis will be smaller in absolute value and one-third will be larger than the standard deviation of the distribution.

Figure 3 shows the distributions of the

differences obtained by reciprocal subtraction for the two selected pairs of examiners. The derivation of Figure 3A from Figure 1A by mirror reflection, doubling the frequency of the zero differences, is readily verified. Similarly, the derivation of Figure 3B from Figure 1B. It may further be noted that Figure 1A can be derived from Figure 2A, and Figure 1B from Figure 2B, by superimposing the frequencies of symmetric measures (-1 on $+1$, -2 on $+2$, and so on). Dotted lines have been erected from the base line at $\pm 1\sigma$. That they enclose in each case approximately two-thirds of the population of differences can be verified by inspection.

In Table 2 is presented a summary of the standard deviations of the distributions of differences for various classifications based on the reports submitted by all five examiners.

TABLE 2.—SUMMARY OF STANDARD DEVIATIONS ACCORDING TO ATTRIBUTE

Attribute	σ_D
Total permanent teeth	1.30
Total deciduous teeth	0.97
Permanent carious teeth	1.69
Deciduous carious teeth	1.49
Total carious teeth	1.98
Filled teeth	0.63
Permanent sound teeth	1.86
Deciduous sound teeth	1.44

If the examining dentists agreed perfectly in diagnosis, the standard deviations would all be zero. The standard deviation of 1.98 for total carious teeth indicates that if the complete set of observations is considered, the examiners differ in one-third of the cases by as many as two teeth diagnosed as carious. To state the matter in another way: If a dentist finds in one child two carious teeth more than another dentist finds in another child, we shall not be able to say that the dental health of the one child is worse than that of the other; for about one-third of the time the dentists would probably disagree that much in diagnosing the condition of the same child, unless improvements had been made in the technic of diagnosis. A liberal criterion of statistical significance is a difference twice its standard deviation. In this case, a reported difference would have to exceed four teeth to be considered significant of an objective difference greater than zero.

Mathematical Note.—We form in each group of determinations of a single case ($X_1, X_2, \ldots Xk$ all the differences $D=X_i-X_j$, where $i, j=1, 2, \ldots k$, provided $i\neq j$. Evidently $\Sigma(X_i-X_j)=0$ and the mean is consequently also zero.

We wish to find the standard deviation of this distribution, summing over N cases. For a group of the determinations of a single case, by symmetric functions, we obtain

TABLE 3.—AVERAGE NUMBER OF CARIOUS TEETH REPORTED BY EACH EXAMINER

Examiner	Carious Teeth per Child
1	3.38
2	3.57
3	2.49
4	4.62
6	3.97

$$\sum_1^k (X_i-X_j)^2 = 2\left[(k-1)\sum_1^k X^2 - 2\Sigma X_i X_j\right] = 2\left[k\sum_1^k X^2 - \left(\sum_1^k X\right)^2\right]$$

The number of differences is the number of permutations of k things taken two at a time or $k(k-1)$. For one case, then,

$$\sigma^2_D = \frac{2}{k(k-1)}\left[k\sum_1^k X^2 - \left(\sum_1^k X\right)^2\right]$$ and for N cases, $$\sigma^2_D = \frac{2}{Nk(k-1)}\left[Nk\sum_1^k X^2 - N\left(\sum_1^k X\right)^2\right].$$

In the present study, $k=5$ and in most of the computations $N=63$. In a few instances, however, the base population varied in size. In computing the standard deviation for deciduous carious teeth,

for example, N=42, the number of children with deciduous teeth.

II. ANALYSIS OF GROUP DIFFERENCES

The average number of carious teeth reported by each of the five examiners is listed in Table 3.

These results are, of course, for the same group of children. We note, for example, that Examiner 4 found 2.1 more carious teeth per child than Examiner 3.

What is the significance of the difference observed between the findings of any two examiners? Not only does one examiner differ from another, but a given examiner diagnosing the same cases will vary. This individual variation enters into our estimation of the consistency with which we may expect two examiners to differ. If further sets of observations of the same kind were obtained, either on the same or a different group of subjects, with how much confidence might we expect similar differences between examiners to be maintained? Conversely, how much variation in the size of the mean difference between two examiners may we expect owing merely to sampling?

We judge a mean difference to be significantly different from zero if it is greater than twice its standard error. In Table 4 are presented the statistical constants needed to evaluate the significance of differences obtaining between pairs of examiners. The values of t listed in the last column of Table 4 are obtained by dividing each mean difference by its standard error. The mean difference is judged to be statistically significant if t is equal to or greater than 2. We note that all but two of the ten values of t appearing in the table exceed this value. We may conclude that eight of the ten observed mean differences are significant of real differences between the examining dentists in reporting on the dental health of the group and are not to be adequately accounted for by mere errors of sampling.

The point may be made that these figures afford us some measure of practical control in the conduct of mass surveys of dental health. Reduction of all these t ratios to insignificance would assure us of satisfactory uniformity among examiners. It might reasonably be adopted as the goal of any program designed to improve examining procedures. In the meantime, such figures emphasize beyond question the absolute indispensability of a suitable correction for the equation of examiners in the comparison of groups examined by different dentists. Where satisfactory uniformity among ex-

TABLE 4.—STATISTICAL CONSTANTS RELATING TO SIGNED DIFFERENCES D IN NUMBER OF CARIOUS TEETH REPORTED BY ALL POSSIBLE PAIRS OF EXAMINERS

Examiners	M_D	σ_D	σ_{M_D}	t
1 and 2	0.1905	1.7948	0.2261	0.84
2 and 6	0.3968	1.7371	0.2189	1.81
1 and 6	0.5873	1.5620	0.1968	2.98
6 and 4	0.6508	1.7520	0.2207	2.95
3 and 1	0.8889	1.7049	0.2148	4.14
2 and 4	1.0476	1.6306	0.2054	5.10
3 and 2	1.0794	1.2089	0.1523	7.09
1 and 4	1.2381	1.6531	0.2083	5.94
3 and 6	1.4762	1.8215	0.2295	6.43
3 and 4	2.1270	1.6214	0.2043	10.41

$$M_D = \frac{\Sigma D}{N} \qquad \sigma_D = \sqrt{\frac{\Sigma (D - M_D)^2}{N-1}} \qquad \sigma_{M_D} = \frac{\sigma_D}{\sqrt{N}} \qquad t = \frac{M_D}{\sigma_{M_D}} \qquad N = 63.$$

TABLE 5.—RANGE OF APPROXIMATELY TWO-THIRDS OF THE DIFFERENCES BETWEEN EACH PAIR OF EXAMINERS

Differences Examiner	Examiner	Range
1 from	2	−1.60 to +1.99
3 from	1	−0.82 to +2.59
1 from	4	−0.42 to +2.89
1 from	6	−0.97 to +2.15
3 from	2	−0.13 to +2.29
2 from	4	−0.58 to +2.68
2 from	6	−1.34 to +2.13
3 from	4	+0.51 to +3.75
3 from	6	−0.35 to +3.30
6 from	4	−1.10 to +2.40

aminers has not been established, it is essential that surveys be set up in such a manner as to make such correction possible. Comparisons between groups made on any other basis are of unknown validity.

The statistics assembled yield further information concerning individual differences among examiners. Approximately two-thirds of the differences between two examiners will fall within the range of $M_D \pm \sigma_D$ We have accordingly drawn up Table 5. It will be noted by inspection of Table 5 that the differences between Examiners 1 and 2 range fairly equally in both directions, and those between Examiners 3 and 4 are predominantly in one direction. Similar comparisons are readily made for all the other pairs of examiners. It emerges that in comparison with the other four examiners, Examiner 4 exhibits a constant bias in favor of a larger number of carious teeth reported.

Mathematical Note.—It is desired to find the standard error of the difference between two series of observations, but since, in the present case, the observations differenced were made on the same population, they are obviously correlated. This circumstance renders the usual formula for the standard error of a difference $\sigma_{M_1-M_2} = \sqrt{\sigma^2_{M_1}+\sigma^2_{M_2}}$ inapplicable. This formula would yield a value far too large. The general formula for the standard error of a difference

$$\sigma_{M_1-M_2} = \sqrt{\sigma^2_{M_1}+\sigma^2_{M_2}-2\,\sigma_{M_1}\,\sigma_{M_2}\,\rho_{12}}$$

necessitates the computation of a correlation term. In order to avoid this, the following formula has been derived.

If we have two series of observations of N cases $(X_1, X_2, \ldots X_N)$ and $(Y_1, Y_2, \ldots Y_N)$, the subscripts denoting the cases, and if we form the differences $D=X_i-Y_i$ where $i=1, 2, \ldots N$, then $M_D = \frac{\Sigma(X-Y)}{N} = M_x - M_y$.

To find the standard error of M_D,

$$\sigma^2_{M_D} = \frac{\sigma^2_D}{N} = \frac{\Sigma(D-M_D)^2}{N(N-1)}.$$

But expanding and clearing, we find that

$$\Sigma(D-M_D)^2 = \Sigma D^2 - 2M_D\Sigma D + NM^2_D = \Sigma D^2 - \frac{(\Sigma D)^2}{N}.$$

Consequently, $\sigma^2_{M_D} = \frac{1}{N(N-1)}\left[\Sigma D^2 - \frac{(\Sigma D)^2}{N}\right]$.

This is equivalent to the formula

$$\sigma^2_{M_D} = \frac{1}{N}\left[\sigma_x^2+\sigma_y^2-2\sigma_x\sigma_y\rho_{xy}\right],$$

in which σ_x and σ_y are the standard deviations of the distributions of the observations.

The formula derived above can be expanded as follows:

$$\sigma^2_{M_D} = \frac{1}{N(N-1)}\left[\Sigma D^2 - \frac{(\Sigma D)^2}{N}\right]$$

$$= \frac{1}{N(N-1)}\left[\Sigma(X-Y)^2 - \frac{[\Sigma(X-Y)]^2}{N}\right]$$

$$= \frac{1}{N(N-1)}\left[2(\Sigma X^2+\Sigma Y^2) - \Sigma(X+Y)^2 - \frac{(\Sigma X)^2+(\Sigma Y)^2-2(\Sigma X)(\Sigma Y)}{N}\right].$$

TABLE 6.—NUMBER OF CARIOUS TEETH IN EACH CASE REPORTED BY EACH EXAMINER

Child No.	Age	Sex	Number of Carious Teeth Reported by Examiner				
			1	2	3	4	6
1	6	♀	10	13	12	14	12
2	5	♂	7	9	9	9	9
3	6	♂	4	11	9	7	5
4	6	♂	5	7	7	8	6
5	6	♀	2	5	1	3	1
6	7	♂	9	13	11	14	11
7	7	♂	4	4	3	7	6
8	9	♂	8	10	7	8	9
9	7	♂	8	8	7	9	9
10	7	♀	6	7	7	7	6
11	9	♀	0	0	0	3	1
12	9	♂	6	5	3	9	5
13	9	♂	6	6	5	7	6
14	8	♂	9	11	6	12	8
15	8	♂	4	3	1	6	3
16	8	♂	2	1	1	2	2
17	9	♂	4	5	3	8	6
18	8	♂	4	6	5	6	5
19	9	♀	7	5	3	4	7
20	10	♂	2	4	0	3	6
21	10	♂	2	2	2	6	3
22	10	♂	0	1	0	2	1
23	11	♀	7	8	6	7	7
24	10	♀	1	0	0	1	2
25	11	♀	8	6	4	9	7
26	10	♂	4	5	4	6	6
27	10	♂	2	2	0	1	2
28	9	♀	7	3	3	6	3
29	10	♀	2	1	1	1	1
30	11	♂	1	2	0	3	2
31	12	♂	2	1	1	3	2
32	10	♀	0	1	0	0	0
33	12	♀	1	4	2	2	5
34	12	♂	4	4	4	6	4
35	11	♂	0	0	1	3	0
36	12	♂	0	0	0	3	2
37	13	♂	1	0	0	0	0
38	11	♂	2	2	2	6	3
39	10	♂	0	0	0	2	1
40	12	♀	0	0	0	0	0
41	11	♀	4	4	3	6	5
42	13	♂	0	0	0	1	1
43	12	♀	3	1	2	3	1
44	13	♀	0	1	0	3	0
45	12	♀	3	1	1	1	2
46	12	♀	4	3	0	3	3
47	12	♀	4	0	0	3	3
48	12	♀	2	0	0	1	1
49	12	♀	0	1	0	2	0
50	13	♂	2	0	0	2	1
51	12	♂	4	3	3	4	5
52	13	♂	3	4	2	5	7
53	12	♂	1	2	0	4	2
54	13	♀	6	6	4	8	10
55	13	♀	2	4	2	3	2
56	13	♂	7	5	3	7	7
57	14	♂	1	1	0	3	3
58	15	♂	4	3	1	4	5
59	13	♀	3	3	2	3	7
60	13	♀	0	0	0	1	0
61	14	♀	2	2	1	2	4
62	14	♂	5	5	3	5	3
63	14	♂	2	1	0	4	4

This formula expresses the standard error of a mean difference in terms of the original observations, but it is not very useful in computation. Since it necessitates summing pairs of observations, it is just as easy to find the corresponding series of differences, and the computations are quicker from there on.

SUMMARY AND CONCLUSIONS

Reports of the number of defective (including extracted) teeth found in a group of sixty-three children by five staff dentists in the Division of Dental Health Education of the Illinois Department of Public Health, who examined the same children independently, have been analyzed in order to obtain specific measures of variation among examiners. The examinations were conducted under as nearly standard conditions as possible in order to yield some estimate of the magnitude of variation to be expected in rapid field surveys of dental health.

The present series of observations leaves no doubt about the importance of the problem. A simple statistical device found useful in evaluating the variability of dental diagnoses was derived. Practical application of the measures developed in control of the diagnostic variability strikingly in evidence is possible.

We wish to acknowledge our indebtedness to Mr. Eugene A. Prange, research assistant in the Statistical Division of the Illinois Department of Public Health, for his development of the statisical formulae.

CURRENT LITERATURE

Rôle of Allergy in the Etiology of Orthodontic Deformity

By T. Wingate Todd, M. Cohen and B. Holly Broadbent

It is reported that of sixty children under treatment for allergy, 75 per cent had orthodontic deformities. A discussion of the factors in development of the jaws suggests that nasal symptoms may influence facial growth and formation of the palate. The significance of the observation was questioned in the discussion.—*J. Allergy*, 10:246, 1939.

Basil G. Bibby.

Cold and Heat Therapy in Dentistry

By C. Ellison

The author believes that the use of cold and heat therapy in dentistry should be based on an accurate diagnosis of the cause and stage of the existing condition. Cold is of benefit when applied to an inflammatory process in the earlier stages and also when the inflammation is of a traumatic origin. It may be analgesic because of its refrigerative properties, but does not inhibit bacterial growth. Heat is indicated in infectious inflammations that are beyond the abortive stage. Localization of the infection, with subsequent drainage, follows the application of heat to the area of inflammation.—*Mil. Surg.*, 85:241, September 1939.

J. W. Volker.

The Teeth of the Nation Are Rotten

The statement, "The teeth of the nation are rotten," was the theme of the presidential address of Mr. T. Walkinshaw to the British Dental Association. To partially rectify this condition, he advocates changes in the national health insurance plan, the board of education's school treatment scheme and enlargement of the navy, army and air force dental schemes. In a discussion of the status of the army, navy and air dental corps, the removal of the undesirable condition of service is recommended, together with enlargement of the existing force. Mr. Walkinshaw points out that the ratio of school dentists to children is 1 to 6,000. This high ratio prevents approximately 20 per cent of the needy children from receiving any form of treatment. In commenting on the National Health Insurance, he deplores the fact that the great majority of societies offer only 50 per cent of the cost of dental services. This discourages conservative treatment and, as a result, 80 per cent of the entire dental benefit total is spent on extraction and prosthesis.—*Lancet*, 2:386, August 12, 1939.

J. W. Volker.

Rôle of Saliva Germs in the Dold Weigmann Inhibition Phenomenon

By V. Mühlenbach

Individual strains of streptococcus obtained from saliva exert a marked inhibiting effect on the growth of *Corynebacterium diphtheriae* and the staphylococcus. The usual commonly occurring saliva micro-organisms apart from the streptococci do not have this effect.—*Ztschr. f. Hyg. u. Infectionskrankh.*, 121:569, 1939; from Brown: *Chem. Abstracts*, 33:6378.

Martin Deakins.

Changes in the Nitrogen Content of Parotid Gland Secretion During and After Prolonged Secretion

By E. Aleksintseva and G. Fol'bort

Prolonged reflex functioning of the parotid gland results in a secretion with a gradually diminishing amount of nitrogen. After one and one-half to two hours, the nitrogen content is entirely negative. It returns to normal in from five to seven days.—*J. Physiol.* (U.S.S.R.), 24:15, 1938; from Karjala: *Chem. Abstracts*, 33:6418.

Martin Deakins.

Vitamin B, Senility and Teeth

By Hans Euler and W. Kollath

Rats fed on a diet deficient in vitamins and minerals die within four weeks. If 12

micrograms of crystalline vitamin B_1 and dipotassium phosphate are added, the animals survive more than two years without any signs of avitaminosis. They are prematurely senile, however. Disturbances of enamel formation and vascularization of the pulp appear. Later, there is a tendency to paraplastic bone formation in the pulp or development of caries.—*Arch. f. exper. Path. u. Pharmakol.*, 189:514, 530, 1938; *Chem. Abstr.*, 33:6392.

MARTIN DEAKINS.

Court Findings in Double Indemnity Case

AN insurance policy provided for payment of double indemnity in case of death "as a result of bodily injury solely by external, violent and accidental means." A patient showed extraordinary symptoms while procaine was being skilfully administered and died shortly afterwards. The death was caused by the administration of procaine to one who was not known or knowable to be hypersensitive to the drug.

The court found that the death was not caused by accidental means within the meaning of the policy. (Otey *vs.* John Hancock Life Ins. Co., 199 S. E. 596 [W. Va., 1938].)

Courts of other states differ in opinion as to what constitutes "accidental means." (Taylor *vs.* N. Y. Life Ins. Co., 176 Minn. 171, 222 N. W. 912, 60 A.L.R. 959 [1929].)—*Am. J. M. Jurisprudence*, 2:149, 1939.

MARTIN DEAKINS.

Foot and Mouth Disease in Man

By A. FLAUM

FROM a critical review of the literature, it is shown that only a very small number of proven cases of foot and mouth disease have been recorded. The establishment of the disease in inoculated guinea-pigs is suggested as a necessary proof of human infection.

Tests of the protective action of the patient's serum may also be made. Four cases of human foot and mouth infection are reported and the lesions of each described. All patients had had immediate contact with infected cattle. It is concluded that, as far as infection in man is concerned, the disease is not a medical problem, since only eight human infections have resulted in Sweden among the many thousands of people who have come in contact with or drunk milk from the 4,300 herds of cattle infected during the 1938-1939 epizootic. The failure elsewhere of inoculations of the virus into human beings to produce infection is offered as additional evidence. A change in the virulence of the virus would be necessary to make human infection important.—*Acta path. et microbiol. Scandinav*, 16:197, 1939.

B. G. BIBBY.

Ist die Karies der Milchzahne durch Verabreichung von Lebertran Gunstig zu Beeinflussen? (Has Cod Liver Oil Any Effect on Caries in Milk Teeth?)

By H. Goll

Two experiments were conducted on children from 2 to 7 years old. They were in very poor domestic circumstances and attended a German kindergarten. The survey covered only the deciduous teeth and the first period extended from February to October. The children received a tablespoonful of cod liver oil daily from the time of the initial examination in May until the beginning of summer of the same year. An examination in October showed great extension of the carious process. Over the winter, a similar study was made in another kindergarten, and again in the same one, but no evidence was obtained that treatment with cod liver oil had any power to influence the course of caries in deciduous teeth already affected.—*Wien. Klin. Wchnschr.*, 52:35, 1939.

(Abstractor's note: Is it possible the experiments were of too short duration to show any evidence of beneficial results of the therapy?)

VIRGIL D. CHEYNE.

How Many Teeth May Be Removed at One Sitting?

By J. GUION

IT has not been long since the dentist would not remove more than two or three teeth at one visit. Now, it is generally agreed that it is best to remove as many as possible without danger to the health of the patient. As a rule, a careful history by the dentist will give information as to whether the patient should visit his physician before having the extractions. The age of the patient is to be given due consideration. The condition of the mouth is to be considered in deciding on extracting. This is particularly

true regarding the presence or absence of inflammation.

With improvements in local anesthetic agents and technics, few extraction operations require general anesthesia. Postoperative pain may be prevented by observing the ordinary procedures of surgery, such as clipping all jagged joints of bone. The patient should continue to brush the teeth and avoid sources of infection that can easily develop.—*South. Med. & Surg.*, 101:398, August 1939.

VIRGIL D. CHEYNE.

Oral Pain as a Factor in Diagnosis

By H. DIERDORFF

PAIN originating in the oral cavity is the most common complaint reported by a patient applying to the dentist for treatment. The author discusses and enumerates the various sources of such pain and the subjective and objective symptoms which must be recognized in arriving at a correct diagnosis. Consideration is given to the fact that dental disease may often be the source of pain referred to far distant parts of the body, and, conversely, disturbances outside the oral cavity may give rise to pain referred to the teeth or oral mucosa. By establishing points for differentiation, the dentist is able to locate the source of the pain and proceed with an accepted method of treatment.—*Mil. Surg.*, 85:216, September 1939.

VIRGIL D. CHEYNE.

Changes in Skull Form

By C. DAVENPORT

IN a paper presented before the American Philosophical Society, the author called attention to the fact that we change the shapes of our skulls, giving our heads different forms as we grow up, according to the predominating activities of the various "ages of man" through which we pass. Dr. Davenport has spent many years in the application of the principles of genetic science to problems in human eugenics. The process begins even before birth, when the skull becomes longer and narrower just before it must make its crucial journey through the birth canal. In early infancy, while it is still only a series of slightly bony plates embedded in flexible cartilage, it shapes itself more broadly as it lies in the crib. Yet children born invalids and condemned to lie in bed all their lives do not keep this crib-influenced skull shape, but eventually acquire nearly standard proportions. "As soon as the infant begins to walk," the author continues, "the head height diminishes or increases only slowly under the pull of gravity, but after one and one-half years the vertical dimension increases rapidly, as though to compensate for the earlier loss. During the period of great activity in jumping and romping, the vertical dimension of the head grows very slowly. The length of the skull grows relatively faster in adolescent boys than in girls."—*Science*, 89: 10 (suppl.), April 28, 1939.

VIRGIL D. CHEYNE.

Repair of Large Defects After Removal of Cancer of the Lips

By E. M. DALAND

A TECHNIC is described for repairing the lip after one-third to four-fifths of the tissue has been removed in excising the tumor. Lateral incisions are made at the base of the rectangular space left by the excision. The two parts of the lip are freed from the mucous membrane, drawn together and sutured vertically in the midline. The horizontal incision is sutured parallel to the lip line.

The operation leaves a completely intact musculature. The functional and cosmetic results are favorable. Twenty-three case histories are given.—*Surg. Gynec. & Obst.*, 69: 347, September 1939.

MARTIN DEAKINS.

Acute Infection of the Circumvallate Papillae

By R. WALDAPFEL

A WELL-CIRCUMSCRIBED and rather unknown clinical entity exists which must be regarded as an abscess of a circumvallate papilla and its own identical gland. Anatomically, this papilla presents a deep circular fossa and the opening of numerous serous glands into this fossa. These two features are unquestionably responsible for the introduction of infection in these papillae. The author presents a case of infection of a circumvallate papilla with retention and abscess formation, the infection progressing in a retrograde manner from the circular fossa into the opening of the serous glands.

Aids in making a differential diagnosis

are the following conditions: 1. The tongue is extremely tender, movable and not greatly swollen and the floor of the mouth is free from infection. 2. The base of the tongue is free from involvement and there is no laryngeal edema. 3. The temperature is only moderately high.

The prognosis is good. Treatment is essentially heat and antiphlogistic applications leading to spontaneous discharge. If the condition is of long duration and fluctuation of the tongue is discernible, a superficial incision is desirable.—*Arch. Otolaryng.*, 30:269, 1939. B. P. KEARNEY.

Twelve Varieties of the Common Cold

By D. JARVIS

THE author recognizes twelve different varieties of the common cold, which he differentiates as follows: (1) the open window cold, (2) the dusty trade cold, (3) the perspiration cold, (4) the sugar cold, (5) the chemical vapor cold, (6) the fruit and vegetable cold, (7) the citric acid cold, (8) the postfestival cold, (9) vasomotor rhinitis, (10) the starch cold, (11) the influenza cold and (12) the drug cold.

A knowledge of the type of cold with which one is dealing hastens the return to normal. The author presents the symptoms, treatment and means of prevention of each type.—*Laryngoscope*, 49:489, 1939.

B. P. KEARNEY.

La Mélanodontie Infantile (Infantile Melanodonty)

By G. BELTRAMI and M. ROMIEV

A REPORT from Marseilles, France, describes a condition of the teeth previously noted in the literature. A white opaque spot first appears on the labial surfaces of the upper incisors of the deciduous dentition. The disintegrating enamel soon becomes decavitated and the diameter of the original opening enlarges. The incisive edge and neck of the tooth in general escape, but fracture soon occurs, and nothing but the root remains. The exposed dentin undergoes chromogenic changes, first to yellow, then brown, then black; and the older the lesion, the deeper the penetration. There is a marked dissimilarity to caries: the underlying dentin is hard; there is no pain, and a considerable deposit of secondary dentin is soon built up. One of the highly resistant melanins (tyrosin) is believed to cause the pigmentation. Chemically it cannot be dissolved and hydrogen dioxide only bleaches it. Tests for iron are negative.

In the past, this condition has been ascribed first to mercurial teething powders. When discovered by Simonton and Jones in the Island of Haiti, it was believed to be due to substitution of modern confectionery products for the native diet (taro) and was termed by these authors "odontoclasia." The present authors believe it due to a nutritional fault affecting calcification, as it is well known that the conditions of life in Marseilles are extremely poor.—*Rev. Stomatol.*, 41:434, June 1939.

(Abstractor's note: Although comprehensive, the study is not thoroughly convincing regarding some of the conclusions. Gross descriptions and the accompanying photomicrographs tend to support their hypothesis regarding the type of lesion, but if the condition was due to a deficiency in calcification, it seems that more contemporary teeth would be affected.)

VIRGIL D. CHEYNE.

Application of Sialography in Non-Neoplastic Diseases of the Parotid Gland

By J. BRADY and A. HOCKER

SIALOGRAPHY, the roentgen visualization of the parotid and submaxillary glands after the injection of lipiodol (40 per cent iodine in poppy seed oil) into their respective ducts, has made possible a definite advance in the study of diseases affecting these organs. Many of the diseases arising in the salivary glands cause characteristic changes which are readily demonstrable in the sialogram. The author presents a brief résumé of the technic employed in both the injection of the oil and the subsequent taking of the roentgenograms.—*Radiology*, 32:131, 1939.

B. P. KEARNEY.

Transplantation of Tooth Germ Elements to Marrow Cavities of Tibias of Kittens

By J. SUTRO and L. POMERANTZ

THE fact that a tumor resembling an adamantinoma develops in the human tibia prompted this study. Unerupted canine teeth were stripped of calcified enamel and dentin, placed in warm Ringer's solution and halved longitudinally, and one half was

placed in the upper third of the tibial marrow cavity. Transplants were examined at intervals from the third day to the one hundred and eightieth day. According to the findings, tooth germ elements transplanted to tibial marrow can regenerate. Which of the various germ elements will proliferate, and to what extent, is dependent on the degree of preservation of the enamel-dentin relationship.—*Arch. Path.*, 28:199, 1939.

B. P. KEARNEY.

Comparative Toxicity of Fluorine in Calcium Fluoride and in Cryolite. I.

By M. LAWRENZ, H. MITCHELL and W. RUTH

TWENTY-FOUR rats, divided into twelve pairs, received the same amount of food daily and the same amount of fluorine in the drinking water. Half of the rats were given fluorine in the form of calcium fluoride, the other group in the form of cryolite. It was found that fluorine in cryolite is no more toxic to growing rats, nor is it retained in the body to a greater extent, than the fluorine in calcium fluoride, when both are administered in aqueous solution at the rate of 0.58 mg. per kilogram of body weight daily. The appearance of striations in the incisor teeth is equally rapid with both fluorine compounds. At an intake equivalent to 13 parts fluorine per million of food consumed, it was found that about 96 per cent of the retained fluorine is deposited in the skeleton, the remaining 4 per cent being about equally divided between teeth and soft tissues.—*J. Nutrition*, 18:115, August 1939.

R. F. SOGNNAES.

Alveolarpyorrhoe und Fokalinfektion. Ihre Klinik und Therapie (Pyorrhea Alveolaris and Focal Infection. Clinical Aspects and Therapy)

By P. ALBANESE

HAVING explained by the use of clinical subjects the meaning of pyorrhea alveolaris, the author affirms its toxic, infectious and allergic nature, framing it in the long chapter on focal infection. He then summarizes the clinical and experimental progress made in the field of focal infection and reconfirms the necessity for a full consideration of it in the light of generalized medicine. In this connection, 250 cases of pyorrhea alveolaris are reviewed, with the deduction that another focus often joins with that of the oral disease. Examples of cases demonstrating respiratory or digestive disturbances due to allergic manifestations are cited and the connection with pyorrhea alveolaris is discussed. Demonstration of such a pathologic consensualism, which cleared up under autotherapeutic epidermal treatment for the allergic condition, is given, and eighteen more are mentioned which showed beneficial improvement. Furthermore, the author believes that his method of cure can profitably be extended to treatment of other diseases in which a combination of toxic infection and allergy exists. In conclusion, the necessity, especially in the severe cases of pyorrhea alveolaris, of completing the epidermal therapy and surgical remedy with the ablation of tartar deposits is suggested.—*Ztschr. f. Stomatol.*, 37:57, August 1939.

VIRGIL D. CHEYNE.

A Preliminary Note on Defective Tooth Structure in Young Albino Rats as a Result of Vitamin-A Deficiency in the Maternal Diet

By HELEN MELLANBY

THIS is believed to be the first work which attempts to find out whether a lack of vitamin A alone in the maternal diet may give rise to abnormalities in the teeth of the offspring. A study was made of the teeth of 3 to 21 day old rats whose mothers had received a vitamin-A deficient diet for from five to seven months. Pathologic conditions were found in the enamel organ as well as in the dentin and the bone surrounding the mandibular teeth. In places, the enamel organ of the incisors degenerated so completely that no ameloblasts were distinguishable, and only part of the enamel matrix was deposited. Degeneration in the odontoblasts was followed by unequal production of dentin, resulting in malformation of the incisors. In the molars, the enamelless areas on the tips of the crowns were accentuated, larger areas of exposed dentin than normal remaining. The dentin was badly calcified in both the incisors and the molars. Groups of ossifying cells were found in the pulp, particularly of the molars.—*Brit. D. J.*, 67: 187, August 15, 1939.

R. F. SOGNNAES.

BIBLIOGRAPHICAL

Medical Jurisprudence and Toxicology

By William D. McNally, A.B., M.D., Assistant Professor of Medicine and Lecturer in Toxicology, Rush Medical College, University of Chicago, Chicago, Ill. 386 pages; 23 illustrations. Cloth. Price $3.75. Philadelphia: W. B. Saunders Co., 1939.

This is a concise, compact volume suitable as a textbook for medical, dental and pharmacy students of forensic medicine and toxicology. The first portion of the book dealing with medical jurisprudence discusses briefly the functions of the coroner, the courts, witnesses and the giving of medical evidence. This is followed by chapters on the signs of death, identification of the dead, injuries and bullet wounds, in which physical data relative to bullet velocity, size of wound produced, etc., are included. Methods of examination of blood stains and seminal stains are detailed. The second portion of the book deals with toxicology. Here, a number of the more common poisons are described and classified, with a discussion of their physical and chemical properties, and the specific treatment for each poison is discussed. There is a short appendix of weights and measures and a complete index. The book contains a fund of practical information and should prove useful as a textbook and brief reference work in this field.

Dentistry for Children

By John C. Brauer, D.D.S., A.B., M.Sc., F.A.C.D., Head of the Department of Preventive Dentistry, Professor of Pedodontics and Director of the Bureau of Dental Hygiene, University of Iowa, College of Dentistry, and Julian D. Boyd, M.S., M.D., Associate Professor of Pediatrics, College of Medicine, University of Iowa. 373 pages. 335 illustrations. Cloth. Price $6.50. Philadelphia: P. Blakiston's Son & Co., 1939.

This volume discusses completely the management of the dental problems of the child. It may be roughly divided into three parts. The first deals with the principles of child psychology, the growth and development of the teeth and operative dentistry for children. This is the longest and most complete part of the book. The methods of managing the child in general practice are adequately discussed, together with the business side of pedodontic practice. Operative dentistry for children is treated by a most complete discussion of suitable cavity preparations, filling materials and fillings for both the deciduous and the permanent teeth. Pulp management is treated in some detail and is followed by a chapter on the treatment of fractured permanent and deciduous teeth which is a valuable contribution to the book. The second part of the volume deals with preventive orthodontia and space retention. Here, one finds an adequate discussion and description of methods of constructing and utilizing space maintainers and the essentials of orthodontic diagnosis and prognosis. The final part of the book is concerned with the medical consideration of the child and includes a brief account of nutrition in childhood, disturbances of metabolism and descriptions of certain communicable diseases. This book may be heartily recommended to practitioners as a reference work and to students as a text in this field. The volume is attractively bound in washable cloth and is printed on excellent paper.

Books Received

Partial Dentures. A System of Functional Restoration

By Ferdinand G. Neurohr, D.D.S., F.I.C.D. Author of chapters in the American Textbook of Prosthetic Dentistry; Fellow of the New York Academy of Dentistry; Attending Prosthodontist at the New York Polyclinic Medical School and Hospital; Special Lecturer in Partial Denture Prosthesis at Columbia University School of Dentistry. Illustrated with 206 engravings. Philadelphia: Lea & Febiger, 1939. Price $6.50.

Infeccao Focal Dentaria Seu Tratamento Pela Diathermo-Coagulaco.

By Dr. Sebastiao Machado de Campos. Sao Paulo, 1939.

OBITUARY

FINIS MARLIN HIGHT

(1886-1939)

In the passing of Finis Marlin Hight, on Sunday, August 6, the Texas State Dental Society was bereft of its most beloved, faithful and prominent member; the dental profession, of one of its outstanding characters.

Dr. Hight was born in Mississippi, October 1, 1886, the son of Dr. E. M. Hight and Sue E. Hight. The family moved to San Antonio during his early childhood, where Dr. Hight was educated and acquired his first interest in dentistry from his father, who was one of the early pioneers in dentistry in Texas.

Dr. Hight graduated with honors from the Texas State Dental College in 1916. Two years later, he became a member of the faculty and for the past nine years had been president of the Board of Trustees.

Dr. Hight was well known to the profession for his basic understanding of complete dental prosthesis. He was regarded as one of the outstanding dental prosthetists in the profession by those who specialize in this field. He made original contributions to the profession, among which were improvements in the methods of manipulating modeling compound in impression technic.

He also devised a very practical method for obtaining a pattern of the gothic arch. Dr. Hight was clinician and essayist before many groups in the United States. He was regarded as a forceful teacher who, because of his understanding of his subject, was able to make others comprehend very easily.

He contributed unselfishly of his talents and ability to the development of dentistry in this section and to the steady growth of the Texas Dental College. His contributions and untiring efforts in his special field were responsible for the elevation of prosthetic dentistry to a high plane in Texas.

Dr. Hight was widely known as a sportsman. Golf, hunting, fishing and the conservation of birds were his hobbies. He was a lover and fancier of bird dogs. His kennels were always entered in field trials, and among his dogs were several champions. At the time of his death, Dr. Hight was chairman of the Harris County Wild Life Planning Board, secretary of

FINIS M. HIGHT, D.D.S.

the Associated Field Trials Club of Texas and past president of the Gulf Coast Field Trial Association.

Now and then, there passes a shadow over the path of life. The reality of a friend slipping out into the vastness of the unknown leaves an aching but beautiful memory. In this brief tribute, those who enjoyed his close friendship knew those great qualities that bespeak the real man. He had no ambition to amass

wealth, nor was he a seeker of fame and illusory honor. To him those things that reached to the center of life, honesty of purpose and speech, professional uprightness, loyalty to friends, insisting on the right as he understood it, and withal a rugged individualism, endeared him to us all.

Coupled with all this was his desire to help those in need or in trouble, thinking less of self and more of giving the word of encouragement. Many dentists knew the path to his door. When advice was necessary, how unstintingly he gave it! The heart and soul of this man, "Finny Hight," has enriched life; and who can tell the length and breadth of his benediction? Those who sat with him in council sensed his virile qualities, applauded his professional principles and recognized that he was endowed in a peculiar way to help lead those in doubt to a better understanding of their professional responsibilities.

On the roll of departed members of the Texas State Dental Society appear many brilliant and inspiring names that will be honored to the end of time. Among the foremost will be that of Finis Marlin Hight; for he was a great and successful dentist, a loving husband, an exemplary American citizen, an outstanding teacher and scientist, a loyal friend of every right thinking individual. Our society has sustained an irreparable loss in his passing, but his record and his sterling, lovable character will ever be an inspiration to us all.

He was a member of the Presbyterian church, the Houston Dental Society, the Texas State Dental Society, the American Dental Association, past president and active member of the American Society of Denture Prosthetists, Fellow of the American College of Dentists, and a member of the Psi Omega Dental Fraternity. He was a member of Holland Lodge—A. F. & A. M., Scottish Rite bodies, Arabia Temple Shrine, Houston Country Club and Houston Club.

Dr. Hight is survived by his wife, Mrs. Madge Dodge Hight; his mother, Mrs. Sue E. Hight, of San Antonio; one stepdaughter, Clara Dodge, and one stepson, Porter Dodge, of Houston; three brothers, Clovis H. Hight, of Lexington, Kentucky, and Terry H. Hight and Sheran H. Hight of San Antonio.

W. H. SCHERER.

DEATHS

Corbett, James C., New York, N. Y.; Northwestern University Dental School, 1902; died July 20.

Hough, N. H., Newton, Iowa; State University of Iowa, College of Dentistry, 1897; died July 24; aged 73.

Mennies, William, Vineland, N. J.; School of Dentistry, University of Pennsylvania, 1915; died March 31.

Olson, C. M., Hinsdale, Ill., Marquette University Dental School, 1900; died June 26; aged 62.

Ottofy, Louis, Oakland, Calif., Western College of Dental Surgeons, 1879; died July 20; aged 79.

Shriver, F. M., Glenwood, Iowa; State University of Iowa, College of Dentistry, 1887; died July 15; aged 93.

Slingsby, Ira William, Fargo, N. D., Northwestern University Dental School, 1919; died May 28; aged 49.

Stever, Mortimer F., Creston, Iowa; School of Dentistry, University of Michigan, 1890; died June 14; aged 70.

Stokes, John F., Rockford, Ill.; Northwestern University Dental School, 1905; died June 22; aged 69.

Throop, C. W., Muncie, Ind.; Indiana University School of Dentistry, 1892; died July 14; aged 74.

Wade, C. R., Pomona, Calif., formerly of Central City, Iowa; died June 27.

Washburn, Frank, Carterville, Ill.; St. Louis University Dental College, 1914; died May 3; aged 50.

Weaver, Marshall, Cleveland, Ohio; Western Reserve University School of Dentistry, 1935; died April 20; aged 30.

INCIDENTS OF PRACTICE

Simplified Method of Impression-Taking for Cast Gold Cores

By Bernard S. Chaikin, D.M.D., Boston, Mass.

A tooth so badly broken down that no solid structure remains in the crown portion that can be utilized in preparation for a porcelain jacket or in any other restoration necessarily suggests but one recourse—a cast core constructed to conform with the normal porcelain jacket preparation.

After the remaining portion of the crown has been cut down flush with the gum surface on all sides except at the labial or buccal surface, which is ground 1 mm. below the gum line, and the root has been drilled to accommodate a suitable size post, it becomes a difficult matter to get an accurate impression of this root preparation with either inlay wax or modeling compound, both of which are extremely difficult to handle in this case with satisfying results. The direct method of impression-taking has its drawbacks, as it is almost impossible to force the wax down to the tip of the opening without locking air under it, especially in the upper jaw. Also, in carving up the crown preparation in the inlay wax, the wax post is very liable to break or become distorted, and a perfect fit is not assured. However, a combination of modeling compound and hard temporary stopping or gutta-percha, using the indirect method, simplifies the problem greatly.

The preparation is first oiled with liquid cocoa butter, and the opening solidly packed with warm gutta-percha. A ready-made nickel post (with the shoulder retained), which has been ground to a size smaller than the prepared area, roughened and undercut or threaded so that it can be locked into the gutta-percha, is then heated and forced through the center of the gutta-percha to the bottom of the prepared area, but with the shoulder exposed. The surplus packing is then trimmed flush with the root. A copper tube is fitted to the root, and a modeling compound tube impression is taken. When the impression is cooled and removed, the gutta-percha and inserted post will be removed with it.

Wax is luted around the finished impression, which is then invested in plaster, and an ordinary amalgam die is packed. It is advisable to mark the die in some way so that the buccal or labial surfaces are readily distinguished. Finally, the core is waxed up on the die, removed, invested, cast and cemented into the root of the tooth, a firm foundation and an ideal preparation for the desired porcelain jacket resulting.

The advantages of the gutta-percha method over the inlay wax are readily realized. Not only is it a time-saver at the chair, since it is more conveniently handled and may be packed into the prepared area without fracturing or locking air under it, but, in the laboratory also, there is less danger of scratching or breaking the impression in preparing the amalgam die, and thus of endangering a perfect fit.

483 Beacon Street.

Care of Copper Electroforming Electrolyte for Inlay Impressions

By Ernest C. Fischer, D.D.S., San Francisco, Calif.

The following information has been gleaned from books on electroforming:

"Copper electroforming is simple if a clean constant electrolyte is used."

" 'Maximum throw' (the ability of an electrolyte to deposit copper in deep impressions) is achieved by using one gallon of a saturated solution of copper sulfate mixed with 3½ ounces of sulfuric acid"; hereafter referred to as the standard solution.

Four changes occur in the process of electroforming:

1. Evaporation of water (approximately 20 per cent in twenty-four hours).
2. Formation of copper sulfate.
3. Gradual exhaustion of sulfuric acid.
4. Mixing of dust and copper oxide into the electrolyte.

Each day, a fresh solution should be used. The used electrolyte is saved. That which remains after a gallon of electrolyte has been

used is tested and restored so that it can be used again.

The used solution is filtered. Water is added until the specific gravity is the same as in a standard solution.

The specific gravity is measured with a Baumé hydrometer, at 10 to 20°. Solutions should be at room temperature. The used solution is brought to the specific gravity of a known standard solution. The average specific gravity of a standard solution is 17° Baumé.

To two ounces of used solution, specific gravity 17° Baumé, 2 dwts. of copper carbonate is added. The solution turns green.

From a titration tube (a Luer syringe could be used), sufficient sulfuric acid is added to turn the green solution blue and it is stirred thoroughly. Sulfuric acid 0.5 cc. will clear the solution if it is standard.

If more than 0.5 cc. of sulfuric acid is required to neutralize the copper carbonate, the solution needs sulfuric acid.

Example: If 0.7 cc. sulfuric acid is used to neutralize the cupric carbonate, the solution needs 12.8 cc. of sulfuric acid.

Three years ago, we started with 4 gallons of electrolyte, which we still have. Sulfuric acid and tap water were the only things added.

Care of the electrolyte eliminated all our difficulties.

Hybrid systems of measurement are the result of using materials on hand. A gallon bottle, a gold scale, a metric titration tube and a 16-ounce graduate were on hand. I bought a Baumé hydrometer.

I prefer to use the metric system throughout.

209 Post Street.

Interradicular Abscess: Case Report

By Montague A. Cashman, D.D.S., Washington, D. C.

The case reported here is of particular interest because of the patient's age, the masked symptoms and the systemic condition. Interradicular abscesses are rare enough in older persons, but even more rare in a young patient.

History.—A woman, aged 28, complained of a constant annoyance in the region of the upper left cuspid tooth. There was a bad taste from this area, and a dull pain which seemed to radiate from the cuspid along the side of the nose and as high as the left eye. The patient recalled having irritated this area at one time with an old toothbrush.

Examination.—An old leaking gingival silicate filling was disclosed, which was sensitive to instrumentation. Vitality tests disclosed a normal response. There was no pain upon palpation. Transillumination disclosed a dark area mesially to the root at about the middle third. The x-rays disclosed marked bone resorption along the mesial side

Fig. 1.

Fig. 2.

of the tooth. Further examination disclosed that a graduated pocket explorer could be carried along the mesial surface of the root to a depth of 8 mm. Finger pressure along the root elicited no exudate.

Upon further questioning, it was learned that the patient was diabetic. There was no apparent cause for this mouth condition. The occlusion was not abnormal, and the

mouth was hygienic. It was decided to perform an exploratory operation.

Tests were made to determine the blood sugar, and insulin was administered prior to the operation. It is said that a patient presenting a diabetic case under control is a good surgical risk, and the physician corroborated this.

Operation.—A flap was laid back, and the mesial surface of the root was completely denuded as high as the apical third. A curet was run high along the root and an abscess was located and removed. Zinc chloride (10 per cent) was placed over the area of operation, which was then sutured, and a drain was placed with its end exposed through the gingival opening of the pocket.

Outcome.—For the first three days following the operation, healing was slow, but satisfactory. For the next nine days, suppuration occurred along the line of incision and the amount of exposure of the mesial surface of the root of the cuspid and the distal surface of the root of the lateral incisor became greater with each succeeding day. The drain was changed regularly and, after the ninth day, treatments were stopped. During the entire postoperative period, all the symptoms remained localized, the patient never giving any evidence of the usual diabetic systemic complications. From the ninth day on, suppuration gradually diminished, and the line of exposure of the roots stopped at about the beginning of the middle third. By the twelfth day, there were no signs of suppuration.

To date, three weeks after the operation, both the lateral incisor and the cuspid are firm in their sockets and the prognosis for both of these teeth is very good.

Comment.—The importance of preoperative and postoperative care is very obvious in this case. On the day of the operation, the patient's insulin dosage was increased a total of 6 units for the two injections prior to the operation, and that evening the injection was postoperatively increased by another two units of insulin. The total insulin intake was 50 units in comparison to the usual 40 daily. After the day of the operation, no increase was made in the amount of insulin, but the patient's diet was very carefully regulated.

On the eighth day, because suppuration along the line of incision was still present, it was decided to again increase the insulin. This, however, proved to be unnecessary, for the patient suffered a slight insulin reaction from this increase, which proved that there were no systemic complications. She returned to her usual insulin schedule and has followed it ever since.

2000 Connecticut Avenue, N. W.

Fused Molars: Report of Case

By Alois D. Newberger, D.D.S., Chicago, Ill.

A man presented himself for the extraction of an upper right second molar tooth, which was slightly extruded owing to the absence of teeth in the lower posterior region. There was also some recession of the gum. A roentgenogram taken before extraction revealed slight decay on the mesial surface of the second molar. Infiltration anesthesia was used. On applying forceps to the second molar, it was noted that the first molar also moved. The patient was advised of the fact.

Fused molars.

On extraction, the two molars came out together. Examination of the extracted teeth revealed that the mesiobuccal root of the second molar was fused to the distobuccal and lingual roots of the first molar. The bony process was filed and suturing was not done. Healing was uneventful.

55 East Washington Street.

TEETH AND THE TEXAS LAW

UNDER date of April 8, the Bureau of Identification and Records of the Texas Department of Public Safety received a request from J. G. McKee, sheriff, and E. G. Pharr, county attorney, of Delta County, Cooper, Texas, that an investigation be made of a burglary which occurred at Pecan Gap, Texas, on the night of April 7. Upon arriving at the scene of the crime, the investigator found that some one had broken the glass out of the front door of a business house and the safe had been tampered with. The knob of the safe door had been knocked, and when this attempt at opening the safe failed, the burglar turned it over and knocked a hole in the back large enough to put his hand through and get the money. An examination of the safe revealed small bits of flesh and hair on the jagged edges of the hole. Lying near the safe was a pair of soft heavy gloves which had evidently been worn by the burglar in view of the fact that no fingerprints were found, although there was found what appeared to be fingerprints in blood, smeared beyond recognition, and evidently left when the burglar cut himself on inserting his arm in the jagged hole.

Fig. 1.—Teeth of Myrel Sullivan.

Fig. 2.—Tooth impressions left in cheese bitten by Myrel Sullivan.

Fig. 3.—Plaster cast of tooth impressions left in paraffin and cast of tooth impressions in cheese. Part of both casts was cut off to allow them to fit closer together in order to emphasize points of similarity.

The sheriff and district attorney informed the state investigator that they had had in custody a suspect by the name of Myrel Sullivan, whom they had questioned approximately one and one half days without results and had released.

After the investigator had made a thorough examination at the scene of the crime, he requested that the suspect be again taken into custody, for further questioning.

At the scene of the crime, it was found that the burglar had gone into a refrigerator box in which the groceryman had kept perishable foods and had taken a bite from a piece of cheese. The investigator requested that the suspect bite into a ball of paraffin in order to get an impression of his teeth, the bite in the cheese having indicated that the burglar had a dental deformity. After a plaster cast had been made of the impressions from the paraffin and another made of the impressions left in the cheese, comparison revealed that the two impressions were identical. When the suspect was confronted with this evidence, he made a voluntary statement to the investigating officers that he was guilty.

DO YOU RECOGNIZE THIS BRIDGEWORK?

JUNE 17, 1939, the body of an unidentified man was found in the town of Glastonbury, Conn. This body was practically a skeleton and every means of identification has been exhausted, save one, and that is the dental work contained in the skull. The findings of a pathologist indicate that the man died of natural causes, there being no evidence of foul play.

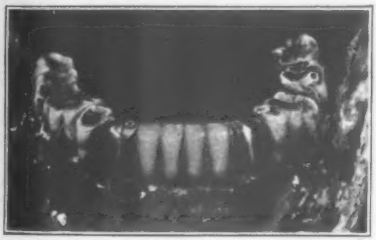


Fig. 1.

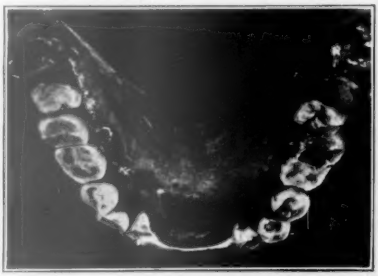


Fig. 2.

Herewith are two pictures from which it is believed that the dentist who did the work may possibly identify the body. As many identifications have been made through the cooperation of the dental profession, it is hoped that publication of these pictures may aid us in this case.

EDWARD J. HICKEY,
Commissioner of State Police,
Hartford, Conn.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

AMERICAN ASSOCIATION OF ORTHODONTISTS, Chicago, Ill., May 13-16, 1940.

AMERICAN DENTAL ASSOCIATION, Cleveland, Ohio, September 9-13, 1940.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY, New York City, October 19.

CHICAGO DENTAL SOCIETY MIDWINTER MEETING, February 12-15, 1940.

DENVER (COLO.) DENTAL ASSOCIATION, Denver, January 7-10, 1940.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

EASTERN ONTARIO DENTAL ASSOCIATION, Ottawa, Canada, October 16-17.

FIVE STATE POST GRADUATE CLINIC, Washington, D. C., May 19-23, 1940.

GREAT LAKES ASSOCIATION OF ORTHODONTISTS, Dearborn, Mich., November 6-7.

GREATER NEW YORK DENTAL MEETING, New York City, December 4-8.

GREATER PHILADELPHIA ANNUAL MEETING, January 30-February 2, 1940.

MIDCONTINENT DENTAL CONGRESS, St. Louis, Mo., October 23-25.

NATIONAL BOARD OF DENTAL EXAMINERS, December 4-5.

NEW ENGLAND DENTAL SOCIETY, Boston, Mass., October 4-5.

NORTH ATLANTIC ORTHODONTIC SOCIETY, New York City, November 15.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, October 11-13.

UNIVERSITY OF BUFFALO DENTAL ALUMNI, Buffalo, N. Y., October 11-18.

STATE SOCIETIES

October

Southern California, at Los Angeles (15-20)

Hawaii, at Wailuku

November

Connecticut, at New Haven (15)

Ohio, at Columbus

Puerto Rico, at Caguas City

February (1940)

Minnesota, at St. Paul (27-29)

April (1940)

Alabama, at Birmingham (9-11)

Kansas, at Kansas City, Mo. (28-30)

Louisiana, at Monroe (18-20)

Michigan, at Detroit (15-17)

Missouri, at Kansas City (28-30)

Texas, at Dallas (9-11)

May (1940)

Indiana, at Indianapolis (20-22)

June (1940)

Connecticut, at New London (5-7)

STATE BOARDS OF DENTAL EXAMINERS

California, in San Francisco, December 4. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Illinois, in Chicago, November 7-10. Homer J. Bird, Springfield, Superintendent of Registration.

Indiana, in Indianapolis, October 23. J. M. Hale, Mt. Vernon, Secretary.

Iowa, at Iowa City, December 11-15. Hardy F. Pool, Mason City, Secretary.

New Jersey, December 11-16. Walter A. Wilson, 148 W. State St., Trenton, Secretary.

Ohio, at Columbus, October 23-28. Morton H. Jones, 1553½ North Fourth St., Columbus, Secretary.

Pennsylvania, in Philadelphia and Pittsburgh, December 5-9. Reuben E. V. Miller, 61 North Third St., Easton, Secretary.

Rhode Island, at Providence, December 12-14. Philip J. Conley, 2 Old Colony Bldg., West Warwick, Secretary.

Texas, at Houston, November 20-23. B. Carl Holder, 1009 Nixon Bldg., Corpus Christi, Secretary.

Wisconsin, in Milwaukee, December 11-15. S. F. Donovan, Tomah, Secretary.

CONNECTICUT STATE DENTAL ASSOCIATION

THE next meeting of the Connecticut State Dental Association will be held at the Griswold Hotel, New London, June 5-7, 1940.

KANSAS AND MISSOURI STATE DENTAL ASSOCIATIONS

A JOINT meeting of the Kansas and Missouri State Dental Associations will be held at Kansas City, Mo., April 28-30, 1940.

MICHIGAN STATE DENTAL SOCIETY

THE next meeting of the Michigan State Dental Society will be held at the Hotel Statler, Detroit, April 15-17.

H. C. GERBER, *Executive Secretary,*
1514 Olds Tower Bldg.,
Lansing.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE next examination for licensure by the Indiana Board of Dental Examiners will be held in Indianapolis beginning October 23. All applications, fees and credentials must be in the hands of the secretary not later than ten days before the examination begins. For applications, instructions to candidates and other information, address

J. M. HALE, *Secretary,*
Mt. Vernon.

DENTAL COUNCIL AND EXAMINING BOARD OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will conduct examinations in Philadelphia and Pittsburgh, December 5-9. For information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg, or

REUBEN E. V. MILLER, *Secretary,*
61 North Third St.,
Easton.

RHODE ISLAND STATE BOARD OF EXAMINERS IN DENTISTRY

THE next examination to be conducted by the Board of Examiners in Dentistry for dentists and dental hygienists will be held at room 365, State Office Building, Providence, December 12, 13 and 14.

All credentials must be on file at least 30 days prior to date of examination or the candidate will not be eligible for this examination. For information and application blanks, address the Department of Health, Division of Examiners, State Office Building, Providence, or

PHILIP J. CONLEY, D.D.S., *Secretary,*
2 Old Colony Bldg.,
West Warwick.

TEXAS BOARD OF DENTAL EXAMINERS

THE Texas Board of Dental Examiners will hold its next examination November 20-23 in Houston. Applications must be filed at least ten days prior to the date of examination. For further information, address

B. CARL HOLDER, *Secretary,*
1009 Nixon Bldg.,
Corpus Christi.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts I and II, December 4-5, in schools where there are five or more candidates. For information and applications, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

THE next meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held October 19 at the Midston House, Thirty-Eighth St. and Madison Ave., New York City. M. L. Axelrod, of Detroit, Mich., will speak on "Newer Trends in Anesthesia"; discussion by Frank W. Rounds, Boston, Mass. Dinner at 7; scientific session, 8:30.

HARRY J. FIELD, *Secretary,*
130 Market St.,
Newark, N. J.

FIVE STATE POST GRADUATE CLINIC

THE Eighth Annual Five State Post Graduate Clinic of the District of Columbia Dental

Society will be held May 19-23, 1940, at the Willard Hotel, Washington.

DAVID J. FITZGIBBON, *Chairman,*
Publicity Committee,
1801 Eye St.,
Washington.

GREATER NEW YORK DENTAL MEETING

THE Fifteenth Annual New York Dental Meeting will be held December 4-8 at the Hotel Pennsylvania, New York City.

PERCY T. PHILLIPS, *Chairman,*
Press and Publicity.

NORTH ATLANTIC ORTHODONTIC SOCIETY

THE Eleventh Semiannual Meeting of the North Atlantic Orthodontic Society will be held November 15 at the Hotel Pennsylvania, New York City. Members of the dental and medical professions are invited.

WALTER H. JACOBS, *Secretary,*
124 West Ninety-Third St.,
New York City.

DENVER DENTAL ASSOCIATION

THE Denver Dental Association will hold its thirty-third annual Rocky Mountain Midwinter Meeting, January 7-10, 1940, at the Shirley Savoy Hotel, Denver, Colo.

ALBERT P. HORTON, *Director,*
206 Metropolitan Bldg.,
Denver.

ALPHA OMEGA FRATERNITY

THE Alpha Omega Fraternity will hold its thirty-second annual convention in Newark, N. J., at the Essex House, December 30-January 1.

WILLIAM RICH, *Supreme Scribe,*
579 Belleville Ave.,
Belleville, N. J.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE thirty-eighth annual meeting of the American Association of Orthodontists will be held in Chicago, Ill., May 13-16, 1940. The meeting will be held at the Edgewater Beach Hotel. All ethical members of the dental profession are invited.

CLAUDE R. WOOD, *Secretary,*
608 Medical Arts Bldg.,
Knoxville, Tenn.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING AUGUST 1939

August 1

No. 2,167,761, to BESSIE M. LEVIN and ISIDORE FLEISCHMANN. Toothbrush.

No. 2,168,270, to ELLWOOD S. PAISLEY and ALLEN F. PETERS. Hypodermic-injection apparatus.

No. D-115,948, to GLENN A. BARNES. Design for a tooth shade guide unit.

August 8

No. 2,168,437, to KENNETH O. BUERCKLIN. Injection device.

No. 2,168,530, to PRODROMUS M. KYPRIE. Method of and means for making dentures.

No. 2,168,546, to NOBLE G. WILLS. Method of preparing dentures.

No. 2,168,686, to JACOB A. SAFFIR. Hypodermic syringe and cartridge.

No. 2,168,689, to WILL O. SMITH and ELIZABETH E. SMITH. Dental cleaning compact.

No. 2,168,953, to HENRY W. HANKINSON. Artificial tooth.

No. 2,168,964, to MAX STRASSER. Toothbrush.

No. 2,168,967, to FREDERICK M. ZULL. Denture.

No. 2,169,082, to EUGENE J. STEVENS and JAY A. HEIDBRINK. Tank Stabilizer for anesthetizing machines.

August 15

No. 2,169,324, to EDWARD L. MONNOT. Dental cuspidor construction.

No. 2,169,371, to MATHEW PAYNE. Syringe.

No. 2,169,581, to MEGUERDITCH DADIAN. Toothbrush.

No. 2,169,719, to ALDEN J. BUSH. Method of selecting artificial teeth.

No. 2,169,731, to GLEN M. LEASE. Pin for artificial teeth and method of making same.

August 22

No. 2,170,182, to ALFRED A. ANTHONY. Tooth powder dispensing device.

No. D-116,254, to ALFRED A. ANTHONY. Design for a combined tooth powder dispenser and toothbrush holder.

August 29

No. Re. 21,187, to WILLIAM J. HOOPER. Dental cleaning spray.

No. 2,171,292, to ALPHONSE F. PIEPER. Fluid control device.

No. 2,171,308, to GEORGE F. W. KING. Rotary toothbrush.

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